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TRAIL AND CAMP SITE EROSION SURVEY FOR GREAT SMOKY MOUNTAINS NATIONAL PARK

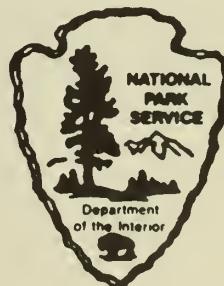
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Part II: Patterns of Overnight Backcountry Use and the Condition of Campsites

RESEARCH/RESOURCES MANAGEMENT REPORT No. 16

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
SOUTHEAST REGION

UPLANDS FIELD RESEARCH LABORATORY
GREAT SMOKY MOUNTAINS NATIONAL PARK
TWIN CREEKS AREA
GATLINBURG, TENNESSEE 37738





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TRAIL AND CAMPSITE EROSION SURVEY
FOR
GREAT SMOKY MOUNTAINS NATIONAL PARK
Part II: Patterns of Overnight Backcountry
Use and the Condition of Campsites

RESEARCH/RESOURCES MANAGEMENT REPORT NO. 16

By

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Definitions:

Permit capacity - The number of people who may legally stay at one campsite on a given night. In the case of shelters this is also design capacity, that is the number of bunks available.

Carrying capacity - A field rating on a 1 through 5 scale which was the investigators estimate of the use of the site relative to the physical limitations of the area.

Physical carrying capacity - The ability of a campsite, relative to topography, erosion sensitivity, and maintainence at the time of the survey, to withstand use.

Design capacity - The capacity of developed site with bunks, platforms or tent spaces for a set number of people or parties.

Metric conversions:

1 meter = 39.4 inches

1 sq. meter = 10.76 square feet

1 hectare = 2.47 acres

All references to degrees ($^{\circ}$) are degree of slope from 0 to 90.

English measurements (miles and feet) have been used for trail distance and elevations, as these were units used on the park maps.

In the park totals columns in the tables, averages for the whole park rather than totals are indicated by an "av".

Patterns of Backcountry Use*

The first pattern of backcountry use to examine is seasonality.

Figure 1 and Table 1 show the number per month of backcountry nights for which permits were issued in 1976. Since the shelters are limited strictly to their design capacity, peaks are absorbed by other legal campsites. Shelters receive relatively more use during the winter (over 50 percent of the total), and account for about 35 percent of the total visitor nights through the year. Usage is not necessarily highest in July and August. In 1976, backcountry use peaked in April at 16,865** visitor nights. Use was as high in May as in June and July. The season of intense backcountry use extends from mid-March to late October (Table 1). The trend may be towards more use in seasons other than the summer. This probably depends somewhat on the weather, but Figure 2 shows strong increases in both spring and fall usage from 1974 to 1976. Even in 1974, usage in April and May was high, about 80 percent of the usage in June and July.

These data indicate that backcountry patrol should probably be started in March and continued well into the fall, possibly through the fall

*The following discussion is based on the tables of 1976 visitor permit information provided by the Data Systems Division of the National Park Service, and 1974 permit data which was summarized by hand by the resources management staff of the park.

** The computer print outs had some minor discrepancies in totals, most of them related to unreadable permits. The figures used here are column totals as found on the print outs.

Table 1. Seasonal backcountry camping use in 1976

	MONTH											
	J	F	M	A	M	J	J	A	S	O	N	D
	3,305	1,679	8,825	16,865	14,799	14,420	14,098	15,408	9,805	10,047	3,547	4,703
Number of persons	1,137	651	3,602	5,655	5,756	5,270	5,149	5,654	3,954	3,640	1,338	1,663
Number of parties	22	53	123	312	442	444	621	666	529	407	74	30
Number of stock	1,599	1,054	3,472	4,539	4,413	4,968	4,847	4,624	3,226	3,744	1,591	2,539
Percent of total nights	53	61	38	27	30	35	35	30	34	38	46	51
Maximum number of persons per day	453	253	653	1,264*	834	778	838	776	982	837	604	520
Minimum number of persons per day	12	15	76	219	330	310	234	276	80	94	10	39
Number of days over 50% of legal capacity	0	0	1	13	3	2	3	4	2	3	0	0

*(Note that the maximum legal capacity for all the sites is 1,256)

Figure 1.

Number of Nights

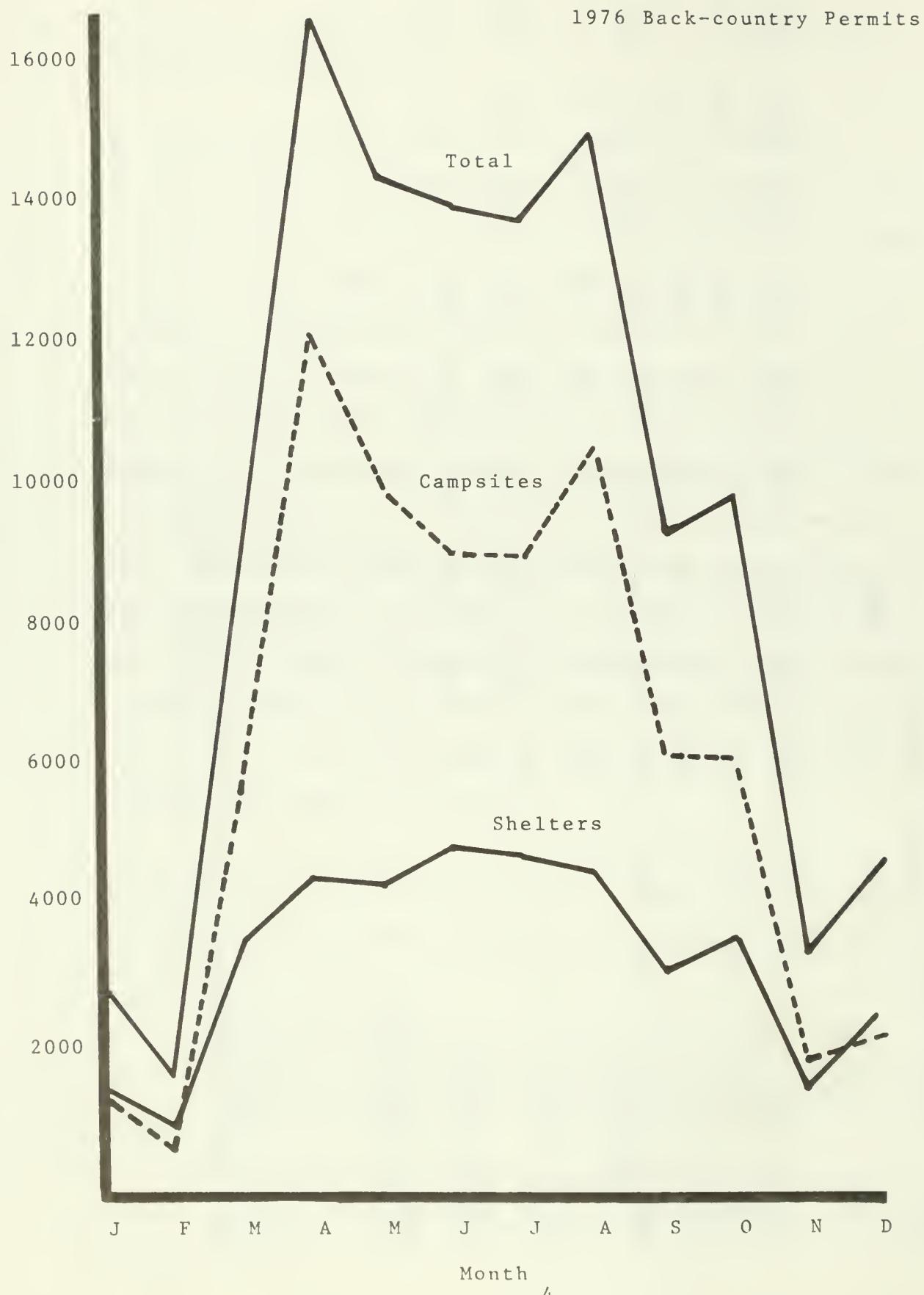
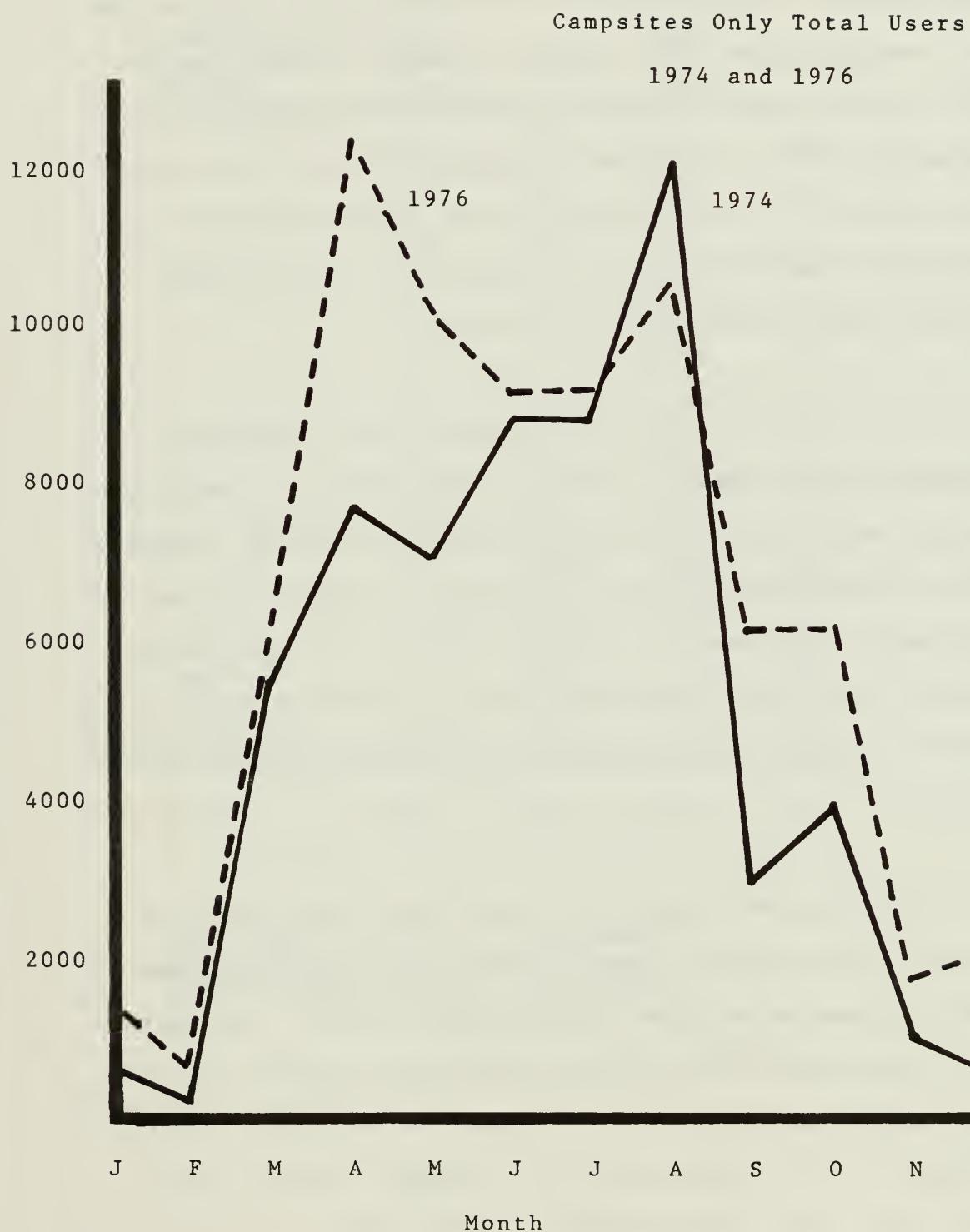


Figure 2.



color period. If any new policies are to be instituted or an attempt is to be made to change patterns of backcountry use, timing could be very important. For certain types of management actions, June may be a very poor time for initiation, since it is the middle of the backpacking season. Heavy spring usage may also affect backcountry bear problems. If the trend towards three season backcountry use continues it may make backcountry management in the Great Smoky Mountains even more difficult in the future.

The times of high usage tend to be clumped. School vacations at Christmas, spring break, etc., have a strong influence. During some periods, such as fall colors, weekends may have very high visitation. Table 1 shows maximum usage per day for the 12 months in the year and the number of days when use exceeds 50 percent of the total permit capacity. There are already periods when the number of people wanting permits is higher than the capacity of the easily accessible sites in the park.

It is very important to note that 1- and 2-night trips make up 64 percent of the total trips taken, although they obviously represent a smaller percent of the total visitor nights (Table 2). This implies that a large percentage of the users will tend to carefully restrict their mileage and may tend to choose sites that are easy to get to from major roads. Someone going on an overnight trip may also be unwilling to drive a long distance to a trail head.

Table 2. Backcountry Campsites Users Length of Stay in Great Smoky Mountains National Park - 1976

Length of Stay (Number of Nights)	Number of Parties	Percent	Number of People	Percent
1	6,512	38.3	18,343	38.5
2	4,179	24.6	12,214	25.6
3	2,446	14.4	6,735	14.1
4	1,427	8.4	3,976	8.3
5	953	5.6	2,663	5.6
6	619	3.6	1,697	3.6
7	542	3.2	1,200	2.5
8	149	0.9	355	0.7
9	103	0.6	232	0.5
10-14	42	0.2	137	0.3
Over 14	4	0.0	14	0.0
Not Given	26	0.2	83	0.2
Total	17,002	100.0	47,649	100.0

Mean length of stay 2.53 nights

Median length of stay.... 1.97 nights

Equally important is the tendency for party sizes to be small. Most groups (79 percent) have one, two, or three people (Table 3). A campsite below permit capacity may have several tents, sometimes spaced at wide distances, and several fires burning at once. Large numbers of small groups will tend to disperse tenting impact over a wider area than a single large group (technically the shelter situation). A site with a permit capacity of 12 a night might well have five parties of two and three in it. A campsite with a limit of 20 could easily have six or eight parties of various sizes. Presently, at the larger campsites, 12 or 14 groups or more might use a site on a major weekend. In some of the smaller campsites in the park, limitation on group number may prove to be as important as limitation of the total number of users.

Table 4 shows a number of summary statistics. Note that the number of visitors using horses is rather low. Shelters are used by 44 percent of the parties and account for 35 percent of the visitor nights (being about 18 percent of the total sites). The Appalachian Trail, which represents about 8 percent of the maintained trail mileage in the park, carries 32 percent of the visitor nights. If management of Appalachian Trail is substantially changed in any way, particularly if visitor use is reduced, the action is likely to have a major impact

Table 3. Backcountry Campsites Party Sizes in Great Smoky Mountains National Park - 1976

<u>Party Size (Number of people)</u>	<u>Number of Groups</u>	<u>Percent</u>
1	2,647	15.6
2	8,385	49.3
3	2,401	14.1
4	1,642	9.7
5	602	3.5
6-12	1,020	6.0
Over 35	5	0.0
Not given	117	0.7
 Total	 17,002	 100.00

Mean party size2.80

Median party size.....2.20

Table 4 . Summary Visitor Statistics for 1976.

Total parties	42929
Total visitor nights	117501
Total stock	3723
Percent of stock nights to visitor nights	3%
Number of parties using shelters	16675
Percent of parties using shelters	44%
Number of visitor nights at shelters	40656
Percent of visitor nights at shelters	35%
Percent of visitor nights on the Appalachian Trail .	32%
Percent of visitor nights in Tennessee	28%
Percent of visitor nights in North Carolina	40%

on other sites in the park. The exceptionally high use of this area should be considered the single most important problem of backcountry management in the park.

The total number of visitors using an individual site during the year varies from less than 100 to over 5,000. Table 5 shows the ranks of individual legal sites in terms of total visitation. The patterns vary from site to site and some areas have had substantial changes in usage in the past 2 years. Table 6 shows the sites by area and the changes in use from 1974 to 1976 (for campsites). Table 7 shows the same information by section of the park. Some high use sites have been relatively stable or shown small increases. Figure 3 shows the use of Walnut Bottoms and Ice Water Springs on a monthly basis. Walnut Bottoms has had a 24 percent increase since 1974, but most of this is due to increased spring and fall use. The peak summer use for the 2 years was about the same. Both these sites were assigned over their total permit capacity for part of the year. Ice Water Springs, for instance, has a legal limit of 12 per night which implies a maximum of 372 per month rather than over 400 visitor nights.

Although some sites have increased or decreased use due to visitor preferences, a number of changes in use are due to changes in park management. Figures 4 and 5 show sites which were influenced by

Table 5 . Ranks of Legal Campsites by Permitted Visitor Nights.

Rank	Site Type	Site No.	Site Name	Number of Visitor Nights
113	2	37	Walnut Bottoms	5126
112	1	5	Ice Water Springs	3642
111	1	18	Mt. LeConte	3334
110	1	6	Mt. Collins	3100
109	1	10	Spence Field	3040
108	2	36	Cataloochee	2959
107	1	17	Kephart	2580
106	2	38	Mt. Sterling	2569
105	1	2	Cosby Knob	2553
104	1	8	Silers Bald	2514
103	1	7	Double Springs	2451
102	1	4	Pecks Corner	2407
101	1	3	Tricorner Knob	2390
100	1	11	Russell Field	2241
99	1	9	Derrick Knob	2207
98	2	13	Sheep Pen Gap	2028
97	1	16	Laurel Gap	1800
96	2	50	Lower Chasteen	1789
95	2	49	Cabin Flats	1766
94	2	33	Maddron Bald	1712
93	2	22	Old Sugarlands	1654
92	1	13	Birch Spring	1466
91	1	12	Mollies Ridge	1432
90	2	39	Pretty Hollow	1394
89	2	9	Anthony Creek	1389
88	1	1	Davenport Gap	1281
87	2	24	Rough Creek	1248
86	2	20	King Branch	1243
85	2	61	Bald Creek	1197
84	2	87	Haw Gap	1148
83	2	34	Sugar Cove	1145
82	2	21	Medicine Branch Bluff	1121
81	2	17	Little Bottoms	1102
80	2	43	Mt. Chapman	1094
79	2	15	Rabbit Creek	1062
78	2	68	Steel Trap	1055
77	2	27	Lower Jakes Gap	1001

Table 5 . Ranks of Legal Campsites by Permitted Visitor Nights.

Rank	Site Type	Site No.	Site Name	Number of Visitor Nights
76	2	48	Upper Chasteen	981
75	2	47	Enloe Creek	964
74	2	83	Bone Valley	893
73	2	44	McGhee Springs	884
72	2	18	West Prong	881
71	2	90	Lost Cove	865
70	2	53	Poke Patch	810
69	2	29	Otter Creek	809
68	2	10	Ledbetter Ridge	797
67	2	23	Camp Rock	793
66	2	12	Ekaneetlee	775
65	2	31	Porters Flat	754
64	1	20	False Gap	751
63	2	35	Gilliland Creek	726
62	2	41	Caldwell Fork	712
61	2	80	Hazel Creek Cascades	701
59.5	2	26	Dripping Springs Mountain	663
59.5	2	28	Marks Cove	663
58	2	40	Big Hemlock	623
57	2	64	Mills Creek	609
56	2	70	Jonas Creek	594
55	2	55	Pole Road	593
53.5	2	71	CCC	592
53.5	2	74	Lower Forney	592
52	2	42	Spruce Mountain	585
51	2	32	Big Creek	560
49.5	1	15	Rich Mountain	553
49.5	1	14	Scott Gap	553
48	2	92	Upper Flats	551
47	2	57	Bryson Place	526
46	2	86	Proctor	490
45	2	82	Calhoun	484
44	2	46	Straight Fork	467
43	2	14	Flint Gap	462
42	2	52	Newton Bald	441
41	2	69	Huggins	435
40	2	84	Sugar Fork	428

Table 5 . Ranks of Legal Campsites by Permitted Visitor Nights.

Rank	Site Type	Site No.	Site Name	Number of Visitor Nights
39	2	11	Beard Cane	408
38	2	73	Bear Creek	401
37	2	60	Bamgardner Branch	396
36	2	93	Twenty Mile Creek	386
35	2	30	Three Forks	356
34	2	51	Towstring	344
32.5	2	88	Pinnacle Creek	333
32.5	2	91	Upper Lost Cove	333
31	2	6	Turkey Pen Ridge	328
30	2	56	Burnt Spruce	317
29	2	19	Upper Henderson	306
28	2	96	Eagle Creek Island	297
27	1	19	Moore Spring	285
26	2	63	Jerry Flat	272
25	2	5	Double Mountain	267
24	2	25	Lower Buckeye Gap	265
23	2	72	White Oak Branch	263
22	2	54	Nettle Creek	260
21	2	85	Sawdust Pile	250
20	2	65	Bear Pen Branch	235
19	2	94	Long Hungry Ridge	206
18	2	62	Upper Ripskin	205
17	2	3	Hesse Creek	202
16	2	67	Goldmine Branch	201
15	2	89	Lower Ekaneetlee	199
14	2	45	No longer used	191
13	2	95	Wolfe Ridge	170
12	2	58	Nicks Nest Branch	149
11	2	59	McCraken Branch	114
10	2	2	Cane Creek	113
9	2	4	Kelly Gap	110
8	2	66	Lower Noland Creek	85
7	2	7	Ace Gap	63
6	2	98	Chambers Creek	54
5	2	75	Hicks Branch	31
4	2	76	Kirkland Creek	20
3	2	77	No name	0
2	2	8	Cades Cove Horse Camp	0
1	2	1	Cooper Road	No data

Table 6 . Campsite Usage 1974 to 1976. - Cont.

Section	Site Number	Total Number Camper Nights 1974	Total Number Camper Nights 1976	Number of Difference	% Change
1	43	605	1094	+489	+81
2	1	370	No data		
	2	43	113	+70	+163
	3	237	202	-35	-15
	11	1237	408	-829	-67
	14	310	462	+152	+49
	15	319	1062	+743	+233
	17	528	1102	+574	+109
3	6	137	328	+191	+139
	8	279	0	Not used	
	9	648	1389	+741	+114
	10	670	797	+127	+19
	12	608	775	+167	+27
	13	1086	2028	+942	+87
	18	864	881	-17	-2
	7* Moved	520	0	-520	
4	19	281	306	+25	+9
	20	538	1243	+705	+131
	26	565	663	+98	+17
	27	486	1001	+515	+106
	28	475	663	+188	+40
5	21	1686	1121	-565	-34
	23	1298	793	-505	-39
	24	2719	1248	-1471	-54
	25	444	265	-179	-40
	30	518	356	-162	-31
6	22	1579	1654	+75	+5
	31	582	754	+172	+30
7	29	289	809	+520	+180
	33	1115	1712	+597	+54
	34	382	1145	+763	+200
	35	0	726	+726	0

Table 6 . Campsite Usage 1974 to 1976.

Section	Site Number	Total Number Camper Nights 1974	Total Number Camper Nights 1976	Number of Difference	% Change
8	4	59	110	+51	+86
	5	533	267	-266	-50
	7* New	0	63	+63	0
9	92	301	551	+250	+83
	93	243	386	+143	+59
	94	67	206	+139	+207
	95	120	170	+50	+42
10	87	801	1148	+347	+43
	88	232	333	+101	+44
	89	294	199	-95	-32
	90	924	865	-59	-6
	91	274	333	-59	-22
	96	94	297	+203	+216
	97	39	113	-26	-67
11	80	1305	701	-604	-46
	81	700	3	Closed due to bears	
	82	384	484	+100	+26
	83	991	893	-98	-10
	84	422	428	+6	+1
	85	396	250	-146	-37
	86	978	490	-488	-50
11	75	139	31	-108	-78
	76	109	20	-89	-82
	77	67	0	-67	0
	98	0	54	+54	0
12	61	1391	1197	-194	-14
	62	211	205	-6	-3
	63	399	272	-127	-32
	64	884	609	-275	-31
	65	332	235	-97	-29
	66	230	85	-145	-63
	67	312	201	-111	-36
	68	1259	1055	-204	-16
	69	464	435	-29	-6

Table 6 . Campsite Usage 1974 to 1976, Cont.

Section	Site Number	Total Number Camper Nights 1974	Total Number Camper Nights 1976	Number of Difference	% Change
	70	998	594	-293	-33
	71	759	592	-165	-22
	72	258	263	+5	+2
	73	256	401	+145	+57
	74	766	592	-174	-23
12	52	346	441	+95	+27
	53	1725	810	-915	-53
	54	246	260	+16	+7
	55	441	593	+152	+34
	56	159	317	+158	+99
	57	818	526	-156	-19
	58	194	149	-45	-23
	59	294	114	-180	-61
	60	590	396	-194	-33
13	48	889	981	-92	-10
	49	1480	1766	+286	+19
	50	1163	1789	+626	+54
	51	465	344	-121	-26
14	44	555	884	+329	+59
	45* Not on 1976 map	634	191	-443	-70
	46	578	467	-111	-19
	47	793	964	+171	+22
15	36* Moved	2567	2959	+392	+15
	39	1331	1394	+63	+5
	40	360	623	+263	+73
	41	471	712	+241	+51
	42	496	585	+89	+18
16	32	No site	2569		
	37	4119	5126	+1007	+24
	38	1593	2569	+976	+61

Figure 3.

Heavily Used Sites

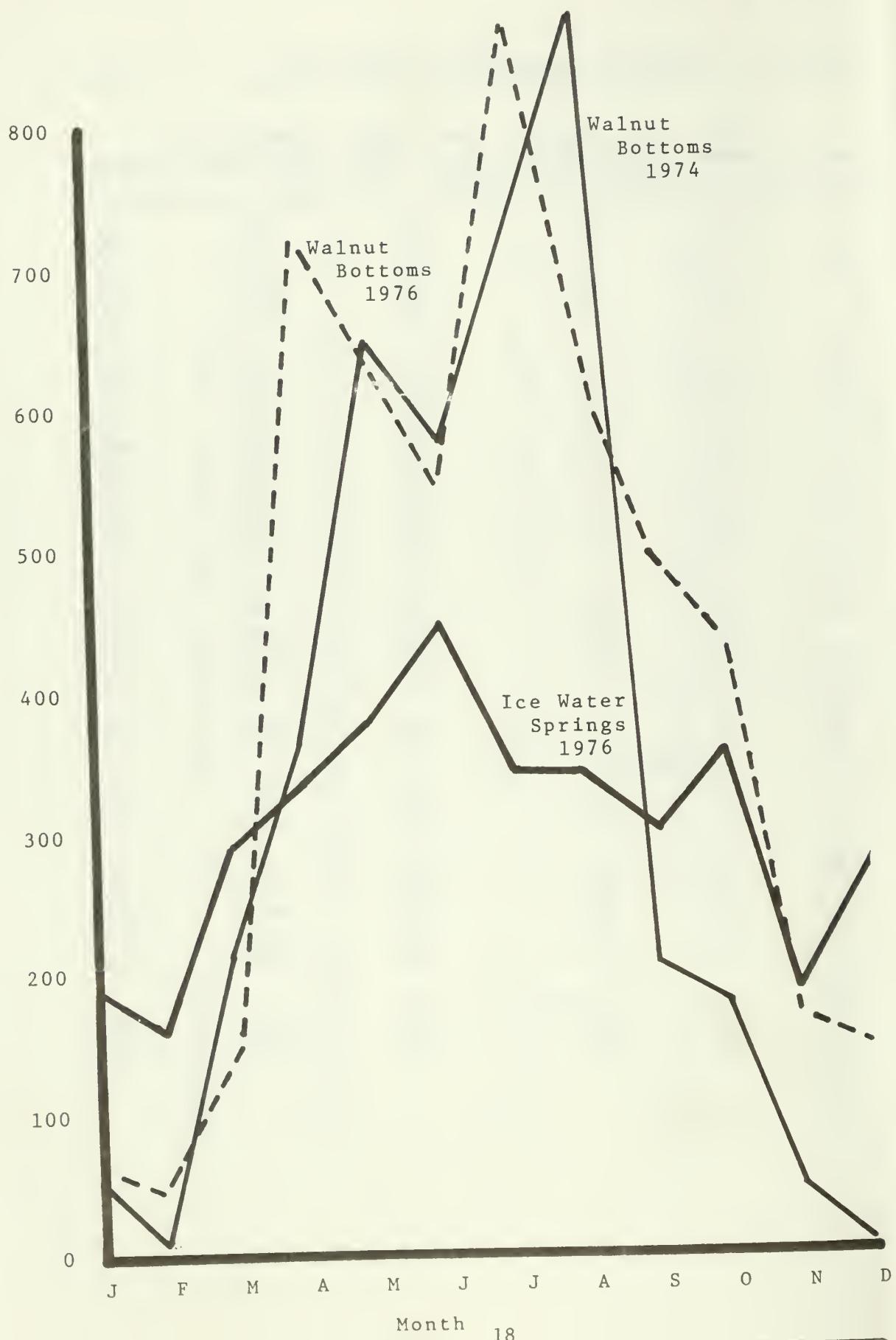


Figure 4.

Rough Creek #24

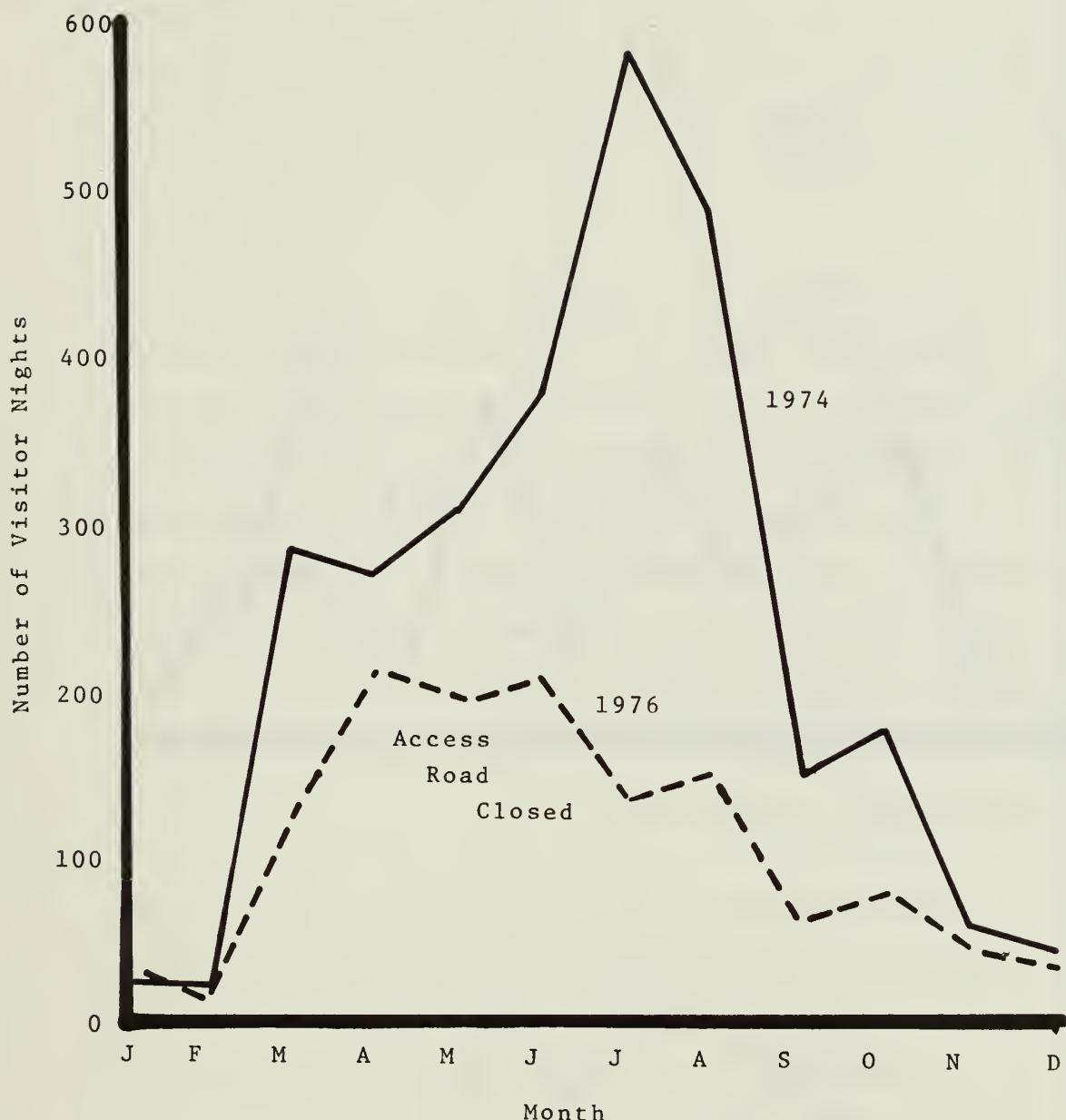
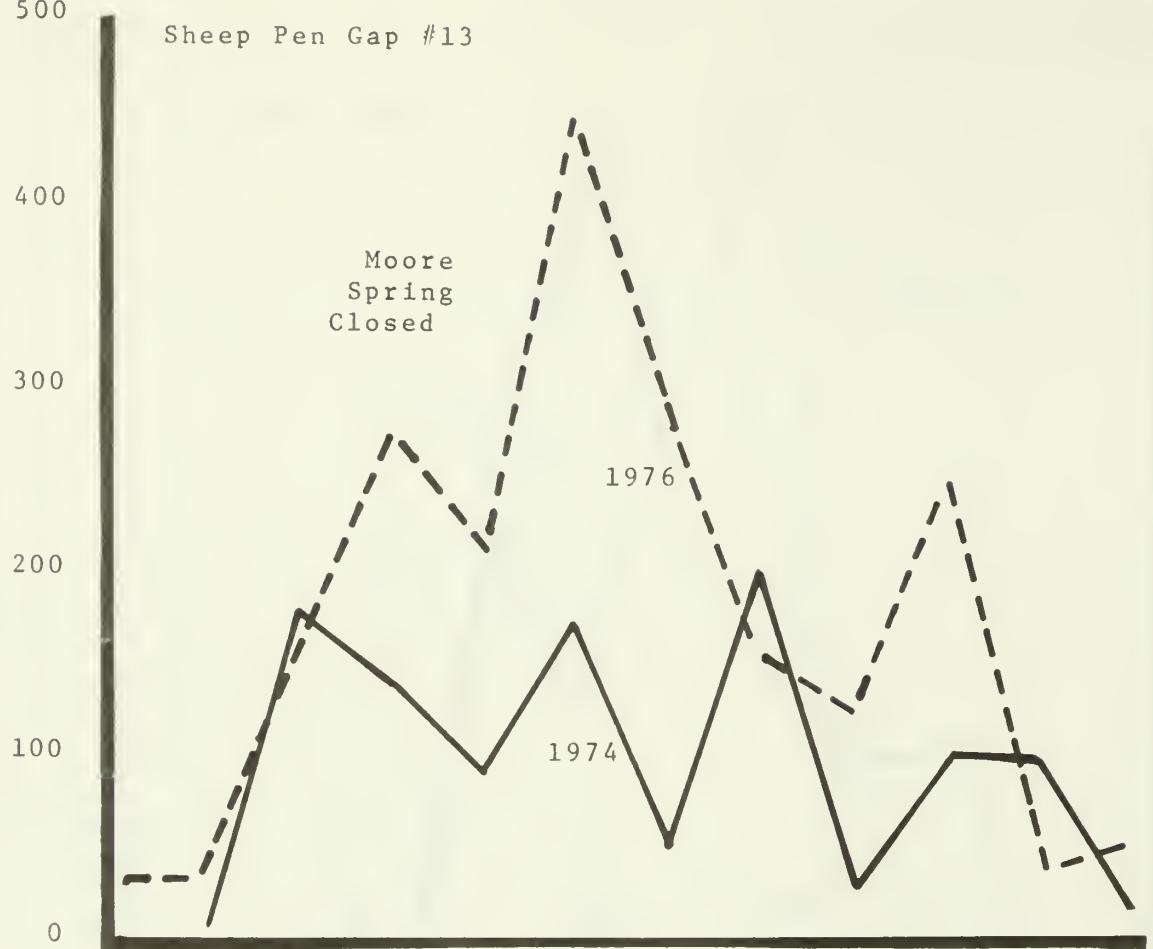
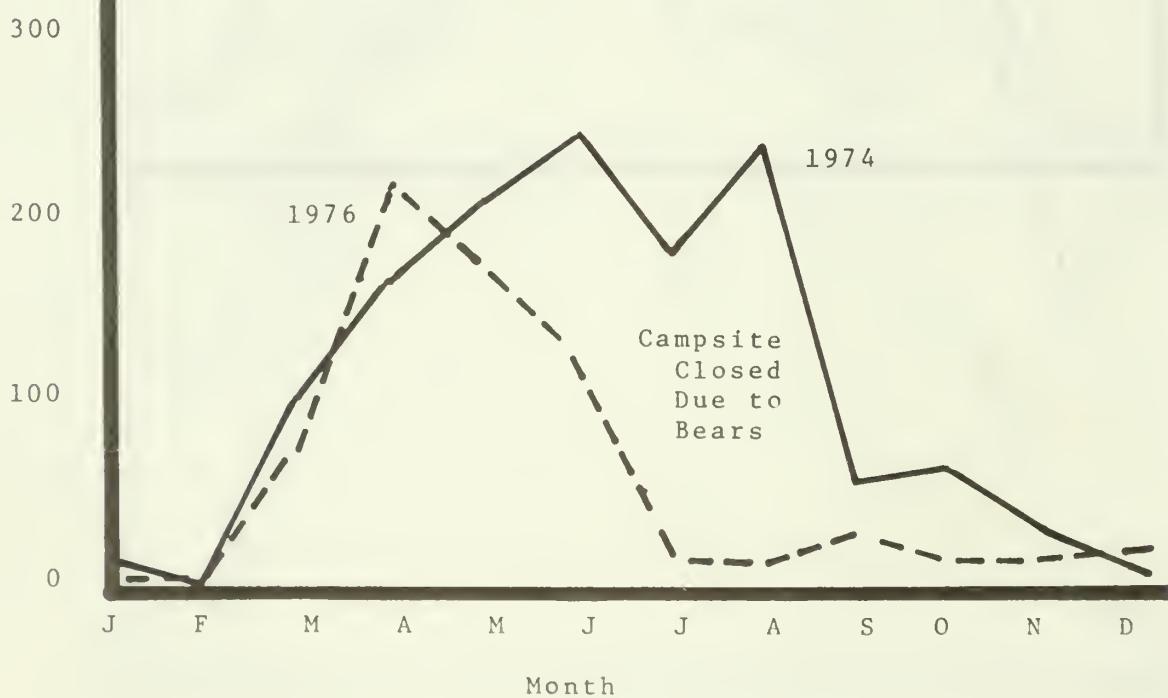


Figure 5.

Sheep Pen Gap #13



Hazel Creek Cascades #80



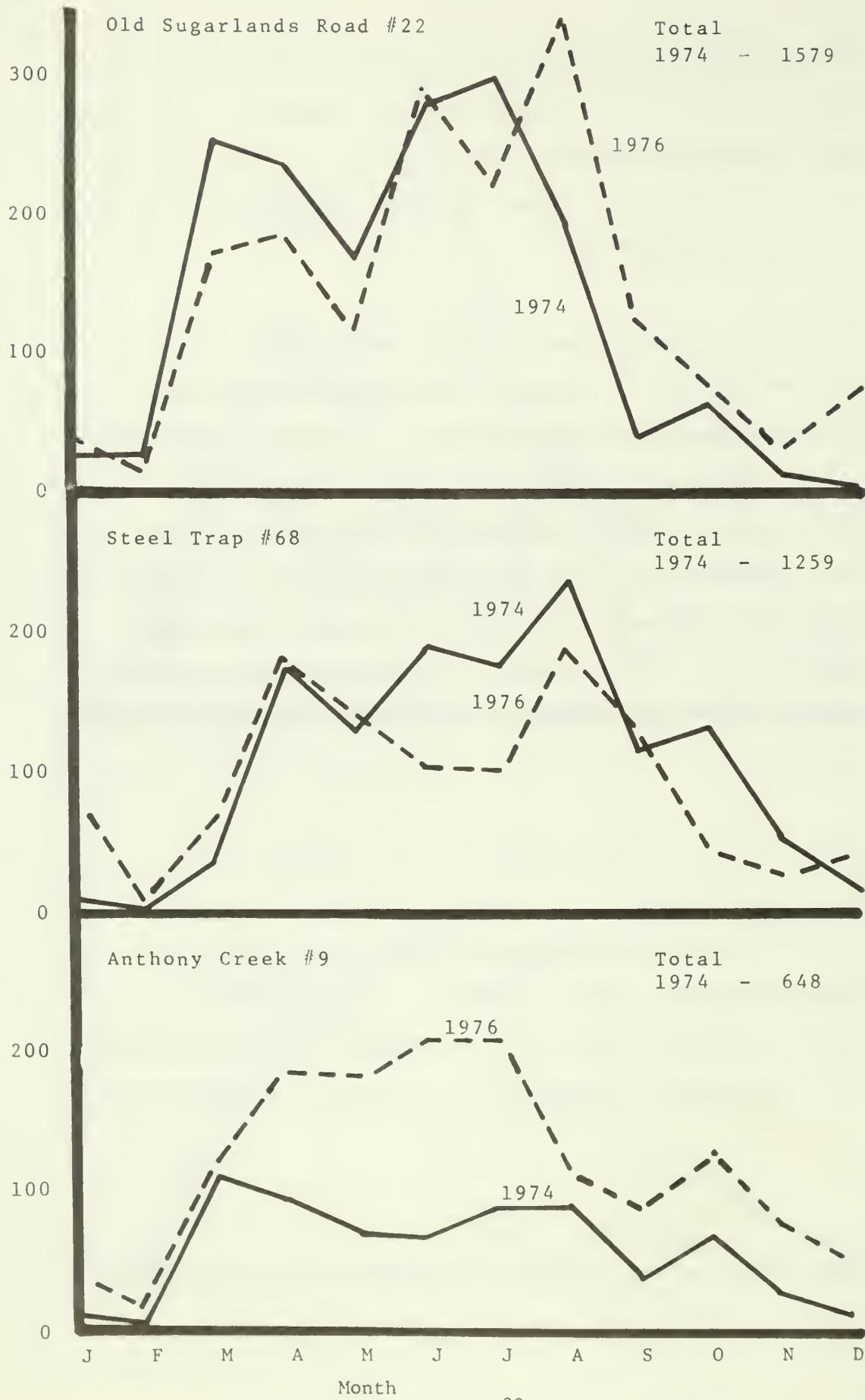
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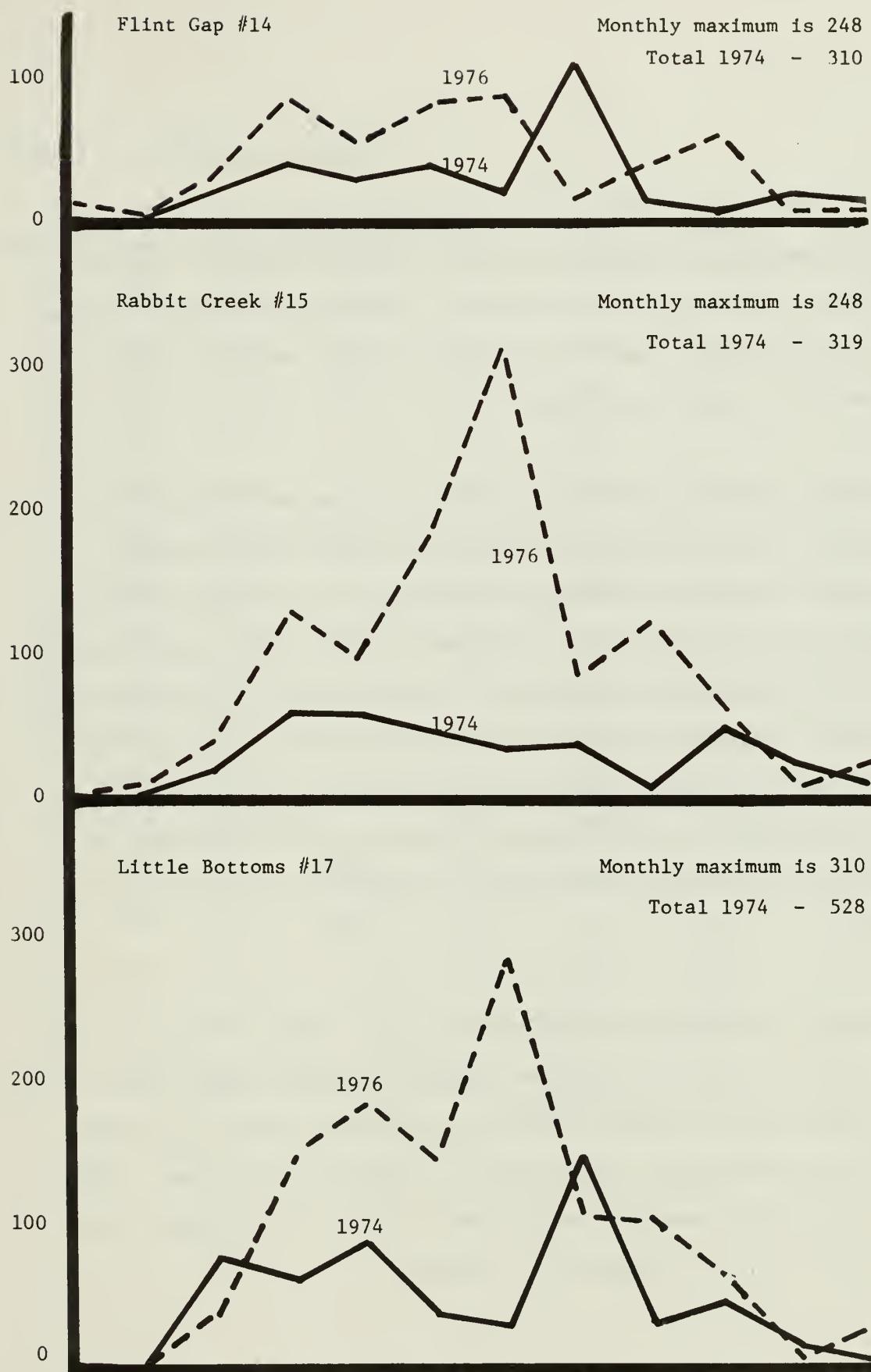
park management. Rough Creek and all the sites above Elkmont had a strong drop (43 percent) in usage in 1976. The closure of an access road increasing the distance to the sites by 3 1/2 miles, may have decreased the use in the Elkmont section(5) and helped increase use in the Tremont section(4).

The closure of Moore Spring shelter may have added to the use at Sheep Pen Gap, which already was a heavily used site (Figure 5). The local rangers became concerned about over use and made an attempt to limit permits for the site during the late summer of 1976. Hazel Creek Cascades has had bear problems for several years. In the spring of 1976, when it appeared the site was going to accumulate as many visitors and bear incidents as previous years, the site was closed. This site is an example of an upper watershed site which has been over-visited at least as far as wildlife interactions are concerned.

Figures 6 and 7 show sites which have had relatively stable visitation for the past 2 or 3 years (22, 68 and 14) and sites which have had increased in visitation which are not due to any definite management action (9, 15 and 17). Anthony Creek is not on a large creek flat and may be developing onto a problem site. The site is similar to Steel Trap, 68, in terms of placement in the

Figure 6.





watershed and is approaching the high usage of Steel Trap. Steel Trap has already had bear problems and there are presently several illegal campsites above and below it. Rabbit Creek and Little Bottoms are also showing significant increases in usage and may be in the process of developing problems.

Table 8 shows individual sites with large increases in use in the last 2 years. The sites are classed according to the percentage increase (it must be 25 percent or greater) and the total visitation. The sites to the right and on the lower lines are those most likely to be expanding and deteriorating due to increased use. The situation with some of the higher elevation sites such as 13, 38, 33, and 29 should be carefully watched since the ecosystems near these sites tend to be fragile. A notable number of these sites with expanding use are in virgin or mature vegetation, including 33, 29, 34, 31, 9, and 12.

Table 7 shows increases in usage by section. Cosby (7) is by far the greatest, with an +146 increase in 2 years. Usage in Cosby (7) and Big Creek (16) areas definitely need tighter control, and Cades Cove is probably over used relative to the size of the sites. Cades Cove (3), Big Creek (16), and Tremont (4) also had increases in use which may tax the capacities of the areas.

Table 7. Usage by Section.

Section	1974 Camps	1976 Camps Shelters		Total 1976	Camps Difference	% Difference	% Total Visitation
1	605	1094	33131	34225	+489	+81	32%
2	3044	3349	553	3902	+305	+10	4%
3	4292	6198	285	6483	+1906	+44	6%
4	2345	3876	-	3876	+1531	+65	4%
5	6665	3783	-	3783	-2882	-43	4%
6	2161	2408	3334	5742	+247	+11	5%
7	1786	4392	-	4392	+2606	+146	4%
8	592	644	553	1197	+52	+9	1%
9	731	1313	-	1313	+582	+80	1%
10	8149	6542	-	6542	-1607	-20	6%
11	8408	6144	-	6144	-2264	-27	6%
12	4813	3606	-	3606	-1207	-25	3%
13	3997	4880	2580	7460	+883	+22	7%
14	2560	2506	1800	4306	-44	-2	4%
15	5225	6273	-	6273	+1048	+20	6%
16	5712	8212	-	8212	+2500	+30	8%
Park	61085	65211	42236	107456	+4126	+7	

Table 8 . Campsites with Large Increases in Visitation Between 1974 and 1976.

Percentage Increase in Visitation 1974 - 1976	Number of Visitor Nights 1976						>2001
	0-200	201-400	401-600	601-800	801-1000	1001-1500	
> +25%	88	55 14	82 52	31 12		87	
> +50%	4 95	93 56	92 73	40 41	44		
> 100%						20 17	27 9
> 150%	2	6 96	94		29	15 43	

Numbers Shown are Site Numbers

* Walnut Bottoms had a 24% increase but is included because of its high visitation.

The 80 percent increase at Twenty Mile (9) probably will not result in serious problems since the area has been so lightly used relative to most of the others. The drop in use above Elkmont is the greatest of any section (-43 percent) and is against the trend of increasing backcountry campsite use (+7 percent average increase for 2 years). There was also a large drop in three sections on the North Carolina side. Note, however, that more of the permits from this area were illegible than from other parts of the park.

Distribution Patterns of Campsites

Before analyzing the data on campsite impact, it is desirable to look at the distribution patterns of the legal campsites in the park. Table 9 shows the distribution of campsites by section. The number of trail miles for the section (as shown on the 1976 Backcountry Map and Camping Guide) is listed with the number of campsites and the total carrying capacity of backcountry campers. The table also shows the number of campsites and the number of overnight hikers allowed per 10 miles of trail. These figures serve as a rough estimate of the official allowable densities for each area. The last column shows the percentage deviation from the mean official carrying capacity for the park. (Note that the sites on the Lake Trail have been excluded because the Lake Trail is not shown on the Backcountry Map.) These mileages are under-estimates; not all maintained trails are shown on the map.

The campsites and carrying capacities are not distributed equally along the trails. Hazel Creek, Forney Creek and the Appalachian Trail have higher official carrying capacities per mile of trail than the park average. Hazel Creek area has over five times the official capacity of the LeConte area. The average number of sites per 10 miles of trail is 1.4 and the average number of campers allowed is 16.9. With the sites on the Lake Trail, the total capacity of backcountry sites per night is 1,288 persons.

Table 9. Official Campsites and Camper Densities per Section.

No.	Section	Miles of Trail	No. of Sites	Hiker Capacity	Sites/ 10 Miles Trail		% Hikers/ 10 Miles Trail
1	Appalachian Trail	69.2	14	168	2.0	24.3	+44
2	Abram's Creek	42.8	8	74	1.9	17.3	+ 2
3	Cades Cove	48.6	7	48	1.2	9.9	-41
4	Tremont - Elkmont	41.7	5	54	1.2	12.9	-24
5	Sugarlands	43.1	5	50	1.2	11.6	-31
6	LeConte	61.8	3	39	.5	6.3	-63
7	Cosby	32.8	4	50	1.2	15.2	-10
8	Boundary Trail	40.9	4	36	1.0	8.8	-48
9	Twenty Mile	18.2	4	44	2.2	19.8	+17
10	Hazel Creek (minus Lake Trail)	51.0	14	176	2.7	34.5	+104
11	Forney Creek	50.8	14	161	2.8	31.7	+88
12	Deep Creek	77.0	9	95	1.2	12.3	-27
13	Smokemont	40.0	5	77	1.3	19.3	+14
14	Heintooga	28.5	4	54	1.4	18.9	+12
15	Cataloochee	62.1	5	70	.8	11.3	-33
16	Big Creek	35.3	3	60	.8	17.0	+ 1
	Park	743.8	107	1256	1.4	16.9	
							(minus Lake Trail)

If the estimated 120,000 backpacker nights in the park in 1976 were absolutely distributed throughout the year, there would be about 330 campers per night in the backcountry. This is about a quarter of the present legal capacity.

Damage by Section

The first problem of campsite management is where are sites over used and where is impact the greatest? Rather than look only at individual sites, it is also important to look at major areas of the park where groups of sites may be differentially impacted. Tables 10 and 11 compare the Appalachian Trail, the Tennessee side and the North Carolina side of the park. As one would expect, the Appalachian Trail has more total disturbance per mile than the two states, but has less total disturbance than the North Carolina side of the park. It is sometimes suggested that the Carolina side of the park is under used relative to the Tennessee side. This may be true in terms of the total number of hikers, but it is certainly not true relative to campsite disturbance. North Carolina has more damage per maintained trail mile of both legal and illegal sites. It also has more legal overnight visitors.

Table 11 shows average values per legal campsite by state. Campsites in North Carolina tend to be larger, but have slightly less bare soil than campsites in Tennessee. Intensive damage was slightly greater in North Carolina and there were slightly more firepits per site (none of these differences are great enough to be significant from a management point of view). North Carolina has far more developments per site (average 2.3 versus .4), but the field ratings for all

Table 10. Total Disturbance by State.

	<u>A. T.</u>	<u>N. C.</u>	<u>TN.</u>	<u>Total</u>
Mileage	69.2	362.9	313.7	745.8
Legal Sites Disturbance m^2	381,945	432,480	254,165	1,068,590
Legal m^2 / Mile	5519	1192	810	1433 (av.)
Illegal Sites Disturbance m^2	2,737	93,681	26,215	122,633
Illegal m^2 /Mile	40	157 (258*)	84	164* (av.)
Total m^2	384,682	526,161	280,380	

* With large site on Heintooga Road

Table 11. Average Legal Campsite Conditions by State.

	<u>N. C.</u>	<u>TN.</u>
Total Area m ²	7,083	3,993
Bare Soil m ²	647	702
Intensive Damage m ²	1,516	1,419
Developments	2.3	.4
Firepits and places	5.3	4.7
<u>Field Ratings</u>		
Carrying Capacity	3.0	3.2
Frequency Use	3.4	3.4
Firewood availability	3.3	3.0
Trash Dispersal	2.4	2.3
Mud and Dirt	2.9	2.8
Vegetation damage	3.1	2.9
Sanitation	2.7	2.8
Placement	2.1	2.3
Drainage	1.5	1.8

categories, such as firewood availability and trash dispersal were almost the same for the two states. In general, average campsite conditions for the two major districts of the park are very similar, with total area and the number of developments being greater on the Carolina side.

For comparative purposes, the park is broken down into 16 sections based on access, stronger differences between areas begin to appear. Table 12 shows total disturbance by section for both legal and illegal sites and also shows disturbance per mile of maintained trail. Table 13 shows the areas of bare soil, intensive damage, mud and trash per section. (Note that here, and in other tables, trash is an ephemeral type of disturbance which will vary with recent usage and maintenance, whereas measurements such as bare soil remain relatively constant from week to week and change more slowly). Close examination of these tables indicates, that although many types of disturbance tend to fall together, an area that has large amounts of one type of damage may have small amounts of another. The Appalachian Trail, for instance, has the highest total disturbance per mile of any section, but has a relatively small area of disturbance due to illegal campsites. (This is probably not due to a lack of illegal campers on the Appalachian Trail, but may be related to the tendency of illegal parties to camp near the shelters, which are usually at the main water sources).

Table 12. Total Disturbance per Section for Legal and Illegal Sites and Disturbance per Mile of Maintained Trail.

<u>Section</u>	<u>Miles</u>	<u>Legal Sites m²</u>	<u>Legal m² per Mile</u>	<u>Illegal Sites m²</u>	<u>Illegal m² per Mile</u>	<u>Total m² per Mile</u>
1	69.2	381,945	5,519	2,737	40	384,682
2	42.8	33,760	789	1,989	47	35,749
3	48.6	107,375	2,209	4,170	86	111,545
4	43.7	2,532	58	2,412	55	4,944
5	43.1	40,815	947	7,055	163	47,870
6	61.8	60,200	974	5,531	90	65,731
7	32.8	1,365	42	3,515	107	4,880
8	40.9	4,200	103	1,943	48	6,143
9	18.2	8,620	474	201	11	8,821
10	51.0	43,582	855	6,430	126	50,012
11	50.8	115,443	2,273	18,846	371	134,289
12	77.0	21,379	278	3,969	52	25,348
13	40.0	106,300	2,658	1,497	37	107,797
14	28.5	27,200	954	4,118*	145*	40,918*
15	62.1	51,626	831	2,731	44	54,357
16	35.3	68,330	1,936	19,089	561	87,419
Park	745.8	1,078,590	1,446	122,633	164	1,201,223
						1,611

* 4118 if large illegal on Heintooga Road removed;
145 per mile without large site; 1435 with large site

Table 13. Totals of Various Types of Intensive Damage Associated with Legal Sites by Section.

<u>Section</u>	<u>Bare Soil m²</u>	<u>Per Mile</u>	<u>Intensive Damage m²</u>	<u>Per Mile</u>	<u>Mud m²</u>	<u>Trash m²</u>
1	4,920	71.1	18,262	263.9	115	66,850
2	1,144	26.7	4,232	98.9	8	2,637
3	4,203	86.5	14,881	306.2	17	15,200
4	1,160	26.5	2,750	62.9	0	2,532
5	2,313	53.7	11,722	272.0	0	21,600
6	2,125	34.4	13,245	214.3	175	16,900
7	116	3.5	708	21.6	15	300
8	213	5.2	882	21.6	0	1,160
9	989	54.3	2,139	117.5	0	244
10	6,159	120.8	19,982	391.8	103	5,604
11	7,363	144.9	25,554	503.0	332	18,807
12	1,837	23.9	3,442	44.7	6	64
13	1,413	35.3	8,068	201.7	0	700
14	720	25.3	4,337	152.2	39	3,000
15	2,265	36.5	7,368	118.6	87	900
16	9,425	267.0	22,988	651.2	618	7,000
Park	72,617	97.4	160,560	215.3	1515	163,498

In terms of total disturbance per maintained mile, the Appalachian Trail, Smokemont, Forney Creek, Cades Cove and Big Creek are the sections in the worst condition; while in terms of disturbance due to illegal camping, Big Creek, Forney Creek, Elkmont and Heintooga are the worst (Figures 8 and 9). Sections with the smallest amounts of total disturbance per mile were Tremont, Cosby, the Boundary Trail, Deep Creek and Twenty Mile. Cataloochee, Abrams Creek and Hazel Creek also had less than 1,000 square meters of total disturbance per mile of maintained trail. (Note that Cosby section was sampled just after site 33 had been moved and 29 established so that two of the sites had very little total impact at the time they were surveyed.)

In terms of bare soil and intensive damage Big Creek, Forney Creek, Hazel Creek and Cades Cove have the greatest amount of damage per mile. Cosby and the Boundary Trail have the least. Elkmont, the Appalachian Trail, LeConte and Smokemont also have more than 200 square meters of intensive damage per trail mile.

Table 14 shows the average size of legal and illegal sites by section. The Appalachian Trail, Big Creek, Smokemont and LeConte have the largest average area per site. Big Creek, Forney Creek, Heintooga and Elkmont have the largest illegal sites. LeConte has more illegal sites than any other section and they out number legal sites 13.7 to 1. In all, .

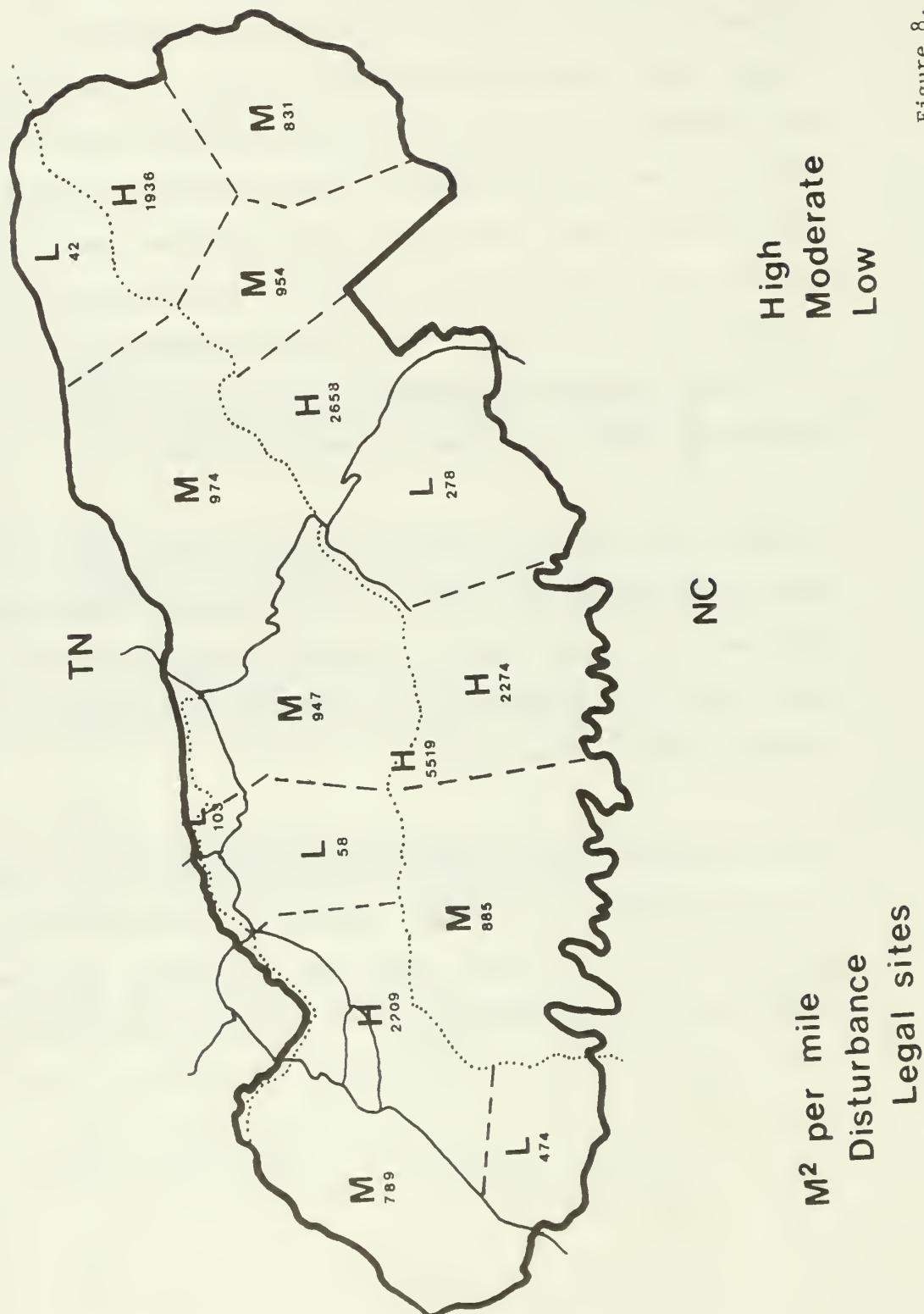


Figure 8.

Figure 9.

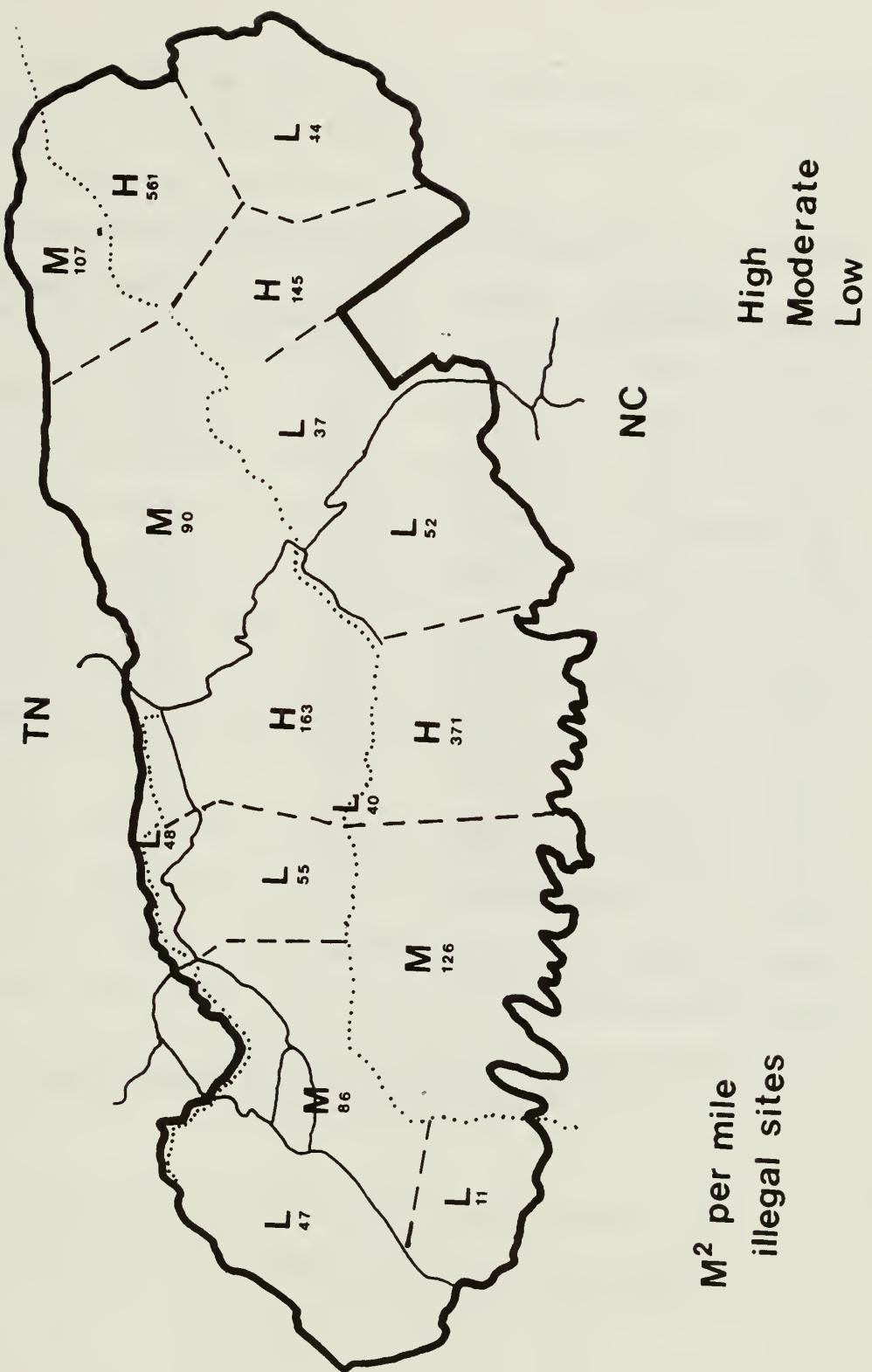


Table 14. Average Size of Legal and Illegal Sites by Section.

<u>Section</u>	<u>Number of Legal Sites</u>	<u>Average m²</u>	<u>Number of Illegal Sites</u>	<u>Average m²</u>	<u>No. Illegal No. Legal</u>
1	15	25,443	29	94	1.9
2	8	4,220	15	133	1.9
3	7	15,339	13	321	1.9
4	5	1,210	10	241	2.0
5	5	8,163	23	307	4.6
6	3	20,067	41	135	13.7
7	4	341	14	251	3.5
8	3	1,400	14	139	4.7
9	4	2,155	4	50	1.0
10	18	2,421	23	280	1.3
11	14	8,246	32	589	2.3
12	9	2,375	14	284	1.6
13	5	21,260	14	107	2.8
14	4	6,880	12	374	3.0
15	5	10,325	11	248	2.2
16	3	22,776	21	909	7.0
Park	113	9,545	289	289*	2.5

* With large former legal site on Heintooga Road

289 illegal sites were sampled with an average area of about 300 square meters each. In the areas investigated, 2.5 illegal sites were found, on the average, for each legal site sampled.

The National Park Service has some control over the number of visitors using an area. The set permit capacity of a site, however, may not correspond to the number of people receiving permits for a site or the number of people actually using it. Table 15 shows three different types of disturbance in terms of the total permit (1976) capacity of a section. The Appalachian Trail, Cades Cove, and LeConte have the most total disturbance per legal visitor night. Smokemont and Walnut Bottoms are also high. Big Creek, LeConte, and Cades Cove are the worst in terms of intensive damage and bare soil.

These data indicate that in Cades Cove section, an overnight backcountry camper can expect his share of the campsite to be about .22 of a hectare of mildly disturbed forest (or about 1/2 acre, the same as a good sized suburban housing lot) and his share of the trampled tenting space to be about 310 square meters, which is about the same size as a family garden plot 40 feet wide by 100 feet long.

The amount of damage per legal visitor night is variable from section to section. The damage for Cades Cove (3) section, for

Table 15. Amount of Disturbance per Section Divided by Permit Capacity (PC) for Legal Sites.

<u>Section</u>	<u>PC</u>	<u>Total Disturbance m² / PC</u>	<u>Bare Soil m² / PC</u>	<u>Intensive Damage m² / PC</u>
1	168	2273	29	109
2	74	456	15	57
3	48	2237	88	310
4	54	47	21	51
5	50	816	46	255
6	39	1544	54	340
7	50	27	2	14
8	36	117	6	25
9	44	196	22	49
10	176	248	35	114
11	161	717	46	159
12	95	225	19	36
13	77	1381	18	105
14	54	504	13	80
15	70	738	32	105
16	60	1139	157	383
Park Average	1256	859	58	128

instance, is over 20 times that for adjoining Twenty Mile (9). The Appalachian Trail is an example of a section which is known to be permitted at about its legal capacity, at least during the summer. If the other sections are brought toward their present legal capacities, damage might well increase into the range of the higher areas. In sections like Forney Creek where damage per mile is already high, but damage per legal visitor night is moderate, an increase in use may result in more sites with very intensive disturbance and excessive problems with trash and bare soil.

Tables 16 through 19 show sectional differences in firepits, developments and field ratings. The maximum number of firepits at a legal site is 28 and the maximum number at an illegal is 6. Forney Creek section has the greatest number of pits, 128. Big Creek and LeConte had the greatest average pits per site (18.0 and 10.7). Sections like Big Creek and Cataloochee have heavily developed sites, while other sections like Tremont and Elkmont have no developments at all. The number of developments is not a good indicator of the amount of damage in a section.

The average and maximum field ratings per section are shown in Tables 18 and 19. The average carrying capacity values indicate that the Appalachian Trail and Cades Cove are well in excess of the physical carrying capacity

Table 16. Number of Firepits plus Fireplaces per Section.

Section	Legals				Illegals			
	No. Legal Sites	Max. Pits	Total Pits	Av. No.	No. Illegal Sites	Max. Pits	Total Pits	Av. No.
1	15	11	48	3.20	29	2	28	.97
2	8	5	22	3.14	15	1	13	.87
3	7	19	42	6.00	13	3	16	1.23
4	5	6	15	3.5	10	4	11	1.10
5	5	16	32	6.4	23	4	29	1.26
6	3	17	32	10.67	41	5	51	1.24
7	4	7	12	3.00	14	5	22	1.57
8	3	4	7	2.33	14	3	16	1.14
9	4	5	13	3.25	4	4	1	1.00
10	18	10	75	4.17	23	4	27	1.17
11	14	13	76	5.43	32	6	52	1.63
12	9	7	29	3.22	14	3	14	1.00
13	5	15	31	6.20	14	2	16	1.14
14	4	3	11	2.75	12	4	14	1.17
15	5	10	31	6.20	11	4	14	1.27
16	3	28	54	19.00	21	5	33	1.57
Park	113	28	530	4.69	289	6	359	1.24

Table 17. Developments by Section for Legal Sites.

<u>Section</u>	<u>Number of Sites</u>	<u>Average per Site</u>	<u>Minimum</u>	<u>Maximum</u>
1	15	3.5	1	6
2	8	.3	0	2
3	8	3.5	0	10
4	5	0	0	0
5	5	0	0	0
6	3	2.0	0	6
7	4	.5	0	1
8	3	1.0	0	3
9	4	.3	0	1
10	18	1.4	0	13
11	14	2.1	0	12
12	9	1.1	0	7
13	5	4.4	0	12
14	4	2.3	0	5
15	5	6.0	0	16
16	3	6.3	1	17
Park	113	2.0	0	17

Table 18. Campsite Ratings by Section for Legal Sites.

<u>Section</u>	<u>Firewood</u>		<u>Trash</u>		<u>Mud & Dirt</u>		<u>Vegetation</u>		<u>Sanitation</u>	
	<u>Av.</u>	<u>Max.</u>	<u>Av.</u>	<u>Max.</u>	<u>Av.</u>	<u>Max.</u>	<u>Av.</u>	<u>Max.</u>	<u>Av.</u>	<u>Max.</u>
1	4.1	5	3.7	5	3.2	5	4.0	5	2.8	5
2	3.3	5	2.3	4	2.5	3	2.9	4	3.0	5
3	3.5	5	3.2	5	3.2	5	3.4	5	3.3	5
4	2.4	3	2.2	3	2.8	4	2.4	3	1.8	3
5	3.6	5	2.4	5	3.2	5	3.4	4	3.2	5
6	3.3	4	3.3	5	3.0	4	3.7	5	2.3	3
7	2.5	3	1.5	3	2.3	3	2.3	3	2.0	3
8	2.7	3	3.0	4	3.0	3	3.0	3	2.7	4
9	2.5	3	2.3	3	2.8	3	3.0	4	3.0	3
10	3.1	5	2.2	3	2.9	5	2.8	4	2.8	5
11	3.6	5	3.2	5	2.9	4	3.2	4	2.2	4
12	3.3	5	2.2	4	2.4	3	3.0	4	2.3	3
13	3.8	5	2.0	3	2.8	4	3.4	5	2.0	3
14	3.0	4	2.3	3	2.8	4	3.0	4	2.5	4
15	3.2	4	1.8	3	2.8	3	3.2	4	2.2	3
16	4.3	5	2.7	4	3.3	4	4.0	5	3.3	3
Park	3.4	5	2.7	5	2.9	5	3.2	5	2.7	5

Table 19. Design Capacity and Frequency Ratings by Section.

<u>Section</u>	Legals				Illegals			
	<u>CC</u> <u>Max.</u>	<u>CC</u> <u>Av.</u>	<u>Freq.</u> <u>Max.</u>	<u>Freq.</u> <u>Av.</u>	<u>CC</u> <u>Max.</u>	<u>CC</u> <u>Av.</u>	<u>Freq.</u> <u>Max.</u>	<u>Freq.</u> <u>Av.</u>
1	5	4.2	5	4.6	5	2.9	5	1.5
2	4	3.0	4	3.1	5	3.2	2	1.5
3	5	4.1	5	4.1	4	2.8	3	2.0
4	3	2.6	3	2.2	4	2.5	3	2.3
5	5	3.8	5	3.6	5	3.0	5	2.1
6	5	3.7	5	4.3	5	3.0	4	1.6
7	3	2.8	4	3.0	5	2.6	4	1.7
8	3	2.7	3	2.7	5	2.1	2	1.3
9	3	2.8	4	3.3	3	2.8	2	1.8
10	4	2.6	5	3.1	5	2.5	4	1.8
11	4	3.1	5	3.7	5	3.0	4	2.0
12	5	3.4	4	2.9	5	3.4	4	1.5
13	5	3.4	5	3.8	4	2.6	3	1.5
14	5	3.8	4	3.3	4	2.9	4	1.8
15	4	3.0	5	4.4	5	2.7	3	1.6
16	4	3.0	5	4.3	5	3.0	4	2.1
Park	5	3.2	5	3.5	5	2.9	5	1.8

of sites. Elkmont, LeConte, and Heintooga area are also rated as well in excess of the tolerance limits of the sites. Only four sections, Tremont, Cosby, Boundary Trail, and Twenty Mile had no sites rated as over carrying capacity. The Appalachian Trail and Big Creek have the poorest ratings for firewood availability followed by Smokemont, Forney Creek, Elkmont and Cades Cove. In these sections, most of the legal sites have little or no firewood available in the area of the site actually used for tenting. The Appalachian Trail has the worst trash dispersal rating, followed by LeConte, Cades Cove and Forney Creek. The highest mud and dirt rating was for Big Creek, followed by Elkmont, Cades Cove and the Appalachian Trail. Vegetation damage was highest for Big Creek and the Appalachian, followed by LeConte, Elkmont, and Cades Cove. Sanitation ratings were poorest for Big Creek, Cades Cove and Elkmont, where the intensively used parts of the camps tend to be near water sources.

The Status of Individual Sites

Tables 20, 21, and 22 show the ranks of the various legal campsites and shelters. The top sites for total disturbance are largely shelters, particularly on the western half of the Appalachian Trail. Most of this type of disturbance is related to firewood gathering. Many of the other large sites are easy access sites or at major trail intersections. The patterns of total disturbance are shown in Figure 10. Note there is a cluster of large sites around the Elkmont, Silers, Forney Creek, and Noland Creek areas. There is another smaller cluster south of Cades Cove and one above Smokement (Figure 10).

If one looks at intensive damage or bare soil, the patterns change. The worst sites are the large horse camps and a number of the creek-side sites (Figure 11). While Forney Creek and Noland Creek are the worst series of sites for bare soil, Walnut Bottoms and Sheep Pen Gap are the worst individual sites for bare soil.

Table 20. Ranks of Legal Campsites by Total Area of Disturbance.

<u>Rank</u>	<u>Site Type & No.</u>	<u>Site Name</u>	<u>Disturbed Area m²</u>
113	1-11	Russell Field	78375
112	1-10	Spence Field	70720
111	1-19	Moore Spring (old)	64500
110	1-9	Derrick Knob	52800
109	1-12	Mollie's Ridge	51750
108	1-18	Mt. LeConte	49000
107	2-49	Cabin Flats	46800
106	1-7	Double Springs	45000
105	2-37	Walnut Bottoms	32000
104	2-50	Lower Chasteen	31800
103	2-13	Sheep Pen Gap	30000
102	2-71	CCC	28250
101	1-8	Silers Bald	25000
100	2-24	Rough Creek	24500
99	2-39	Pretty Hollow	23925
98	2-32	Big Creek (on road)	23400
97	2-62	Upper Ripskin	22500
96	2-44	McGhee Springs	18900
95	2-61	Bald Creek	18750
94	1-17	Kephart	14500
93	2-38	Mt. Sterling	12930
92	2-36	Cataloochee (on road)	12275
90.5	2-17	Little Bottoms	12000
90.5	1-3	Tricorner	12000
89	2-86	Proctor	10900
88	2-57	Bryson Place	10800
87	1-14	Scott Gap	10380
86	1-6	Mt. Collings	10000
85	2-83	Bone Valley	9180
84	2-10	Jonas Creek	9100
83	2-51	Towstring	9000
82	2-22	Old Sugarlands Road (on road)	8400
81	2-65	Bear Pen Branch	8150
80	2-40	Big Hemlock	7626

Site Type: Shelters = 1, Campsites = 2

Table 20. Ranks of Legal Campsites by Total Area of Disturbance.
Cont.

<u>Rank</u>	<u>Site Type & Number</u>	<u>Site Name</u>	<u>Disturbed Area m²</u>
78.5	2-74	Lower Forney	7500
78.5	1-4	Pecks Corner	7500
77	1-20	False Gap	6600
76	2-15	Rabbit Creek	6400
75	2-64	Mills Creek	6270
73.5	2-85	Sawdust Pile	6000
73.5	1-13	Birch Springs	6000
72	2-25	Lower Buckeye Gap	5940
71	2-84	Sugar Fork	5292
70	2-8	Cades Cove Horse Camp	5000
68.5	1-2	Cosby Knob	5000
68.5	2-69	Huggins	5000
67	2-41	Caldwell Fork	4800
66	2-55	Pole Road	4400
64.33	2-93	Twenty Mile Creek	4200
64.33	1-1	Davenport Gap	4200
64.33	2-40	Upper Chasteen	4200
61.5	2-9	Anthony Creek	4000
61.5	1-5	Ice WAter Springs	4000
60	2-92	Upper Flats	3750
59	2-30	Three Forks	3600
58	2-47	Enloe Creek	3500
57	2-23	Camp Rock	3400
56	2-21	Medicine Branch Bluff	3375
54.5	2-73	Bear Creek	3200
54.5	2-81	Proctor Creek	3200
52.25	2-68	Steel Trap	3000
52.25	2-43	Mt. Chapman	3000
52.25	1-16	Laurel Gap	3000
52.25	2-42	Spruce Mountain	3000
49	2-31	Porter's Flat	2800
48	1-15	Rich Mountain	2500
46.5	2-10	Ledbetter Ridge	2475
46.5	2-54	Nettle Creek	2475
45	2-26	Dripping Springs Mountain	2400
44	2-67	Goldmine Branch	2225

Table 20. Ranks of Legal Campsites by Total Area of Disturbance.
Cont.

<u>Rank</u>	<u>Site Type & Number</u>	<u>Site Name</u>	<u>Disturbed Area m²</u>
43	2-11	Beard Cane	2100
42	2-46	Straight Fork	1800
41	2-82	Calhoun	1750
40	2-14	Flint Gap	1560
39	2-27	Lower Jakes Creek	1500
38	2-90	Lost Cove	1440
37	2-53	Poke Patch	1400
35.33	2-4	Kelly Gap	1200
35.33	2-28	Marks Cove	1200
35.33	2-80	Hazel Creek Cascades	1200
33	2-56	Burnt Spruce	1176
32	2-97	Big Walnut	1000
31	2-1	Cooper Road	900
30	2-20	King Branch	800
28.5	2-63	Jerry Flat	750
28.5	2-91	Upper Lost Cove	750
27	2-87	Haw Gap	720
25.33	2-18	West Prong	700
25.33	2-12	Eakaneetlee	700
25.33	2-34	Sugar Cove	700
23.25	2-33	Snake Den Mountain	500
23.25	2-96	Eagle Creek Island	500
23.25	2-5	Double Mountain	500
23.25	2-72	Whiteoak Branch	500
19	2-94	Long Hungry Ridge	420
17.5	2-88	Pinnacle Creek	400
17.5	2-6	Turkey Pen Ridge	400
16	2-76	Kirkland Creek	375
15	2-3	Hesse Creek	360
14	2-60	Bumgardner Branch	350
13	2-58	Nicks Nest Branch	312
12	2-98	Chambers Creek	300
10.5	2-52	Newton Bald	250
10.5	2-95	Wolfe Ridge	250
9	2-66	Lower Noland Creek	248
8	2-89	Lower Eakaneetlee	225

Table 20. Ranks of Legal Campsites by Total Area of Disturbance.
Cont.

<u>Rank</u>	<u>Site Type & Number</u>	<u>Site Name</u>	<u>Disturbed Area m²</u>
7	2-59	McCraken Branch	216
6	2-75	Nicks Branch	180
5	2-77	No Name on Lake Trail	170
4	2-35	Gilliland Creek	160
3	2-19	Upper Henderson	150
2	2-29	Otter Creek	105
1	2-2	Cane Creek	60

Table 21. Ranks of Legal Campsites by Total Area of Intensive Damage.

<u>Rank</u>	<u>Site Type*</u> <u>and No.</u>	<u>Site Name</u>	<u>Area of Intensive Damage m²</u>
113	2-37	Walnut Bottoms	15067
112	1-3	Tricorner	10800
111	2-22	Old Sugarlands Road	10080
110	2-13	Sheep Pen Gap	8400
109	2-62	Upper Ripskin	8002
108	2-24	Rough Creek	6000
107	2-64	Mill Creek	5349
106	2-32	Big Creek (on road)	5316
105	2-86	Proctor	4530
104	2-83	Bone Valley	4380
103	2-30	Three Forks	3600
102	2-70	Jonas Creek	3475
101	2-85	Sawdust Pile	3266
100	2-8	Cades Cove Horse Camp (old)	2975
99	2-44	McGhee Springs	2837
98	2-69	Huggins	2711
97	2-36	Cataloochee (on road)	2675
96	2-38	Mt. Sterling	2605
95	1-17	Kephart	2250
94	2-31	Porters Flat	2000
93	2-39	Pretty Hollow	1800
92	2-50	Lower Chasteen	1750
91	2-41	Caldwell Fork	1725
90	2-49	Cabin Flats	1500
89	1-14	Scott Gap	1474
88	2-82	Calhoun	1375
87	2-51	Towstring	1368
86	2-27	Lower Jakes Gap	1340
85	2-9	Anthony Creek	1250
84	2-74	Lower Forney Creek	1246
83	2-48	Upper Chasteen	1200
82	1-18	Mt. LeConte	1165
81	2-53	Poke Patch	1107
80	1-1	Davenport Gap	1100

* Shelters = 1; Campsites = 2

Table 21. Ranks of Legal Campsites by Total Area of Intensive Damage - Cont.

Rank	Site Type and No.	Site Name	Area of Intensive Damage m ²
79	2-10	Ledbetter Ridge	1075
78	1-5	Ice Water Springs	1000
77	2-84	Sugar Fork	987
76	2-14	Fling Gap	932
75	2-57	Bryson Place	925
74	2-93	Twentymile Creek	900
73	2-25	Lower Buckeye Gap	894
72	1-10	Spence Field	806
71	2-90	Lost Cove	790
70	2-91	Upper Lost Cove	780
69	2-21	Medicine Branch Bluff	752
67.5	1-6	Mt. Collins	750
67.5	1-9	Derrick Knob	750
66	2-68	Steel Trap	746
65	2-81	Proctor Creek	738
64	2-87	Haw Gap	720
63	2-4	Kelly Gap	714
62	2-67	Goldmine Branch	709
61	2-61	Bald Creek	663
60	2-73	Bear Creek	656
59	2-92	Upper Flats	653
58	2-40	Big Hemlock	652
57	1-2	Cosby Knob	650
56	2-43	Mt. Chapman	644
55	2-18	West Prong	633
54	2-1	Cooper Road	625
52	2-20	King Branch	600
52	2-17	Little Bottoms	600
52	2-46	Straight Fork	600
50	2-71	CCC	575
49	2-28	Marks Cove	560
48	1-16	Laurel Gap	540
47	2-65	Bearpen Branch	539
46	2-42	Spruce Mountain	516
45	2-96	Eagle Creek Island	500
44	2-23	Camp Rock	476

Table 21. Ranks of Legal Campsites by Total Area of Intensive Damage - Cont.

<u>Rank</u>	<u>Site Type and No.</u>	<u>Site Name</u>	<u>Area of Intensive Damage m²</u>
43	2-94	Long Hungry Ridge	440
42	2-63	Jerry Flat	435
41	2-97	Big Walnut	402
39.5	2-56	Burn ⁺ Spruce	400
39.5	1-20	False Gap	400
38	2-47	Enloe Creek	360
37	1-7	Double Springs	358
36	1-13	Birch Spring	355
35	2-76	Kirkland Creek	313
34	2-33	Snakeden Mountain	302
32.5	2-54	Nettle Creek	300
32.5	2-34	Sugar Cove	300
31	1-19	Moore Springs	291
30	1-4	Pecks Corner	275
29	2-77	(no name - Lake Trail)	272
28	2-55	Pole Road	260
27	2-52	Newton Bald	256
26	2-11	Beard Cane	250
25	2-66	Lower Noland Creek	248
23.5	2-88	Pinnacle Creek	240
23.5	2-26	Dripping Springs Mountain	240
22	2-98	Chambers Creek	226
21	2-72	Whiteoak Branch	200
20	2-80	Hazelcreek Cascades	185
19	2-12	Ekaneetlee	167
18	2-89	Lower Ekaneetlee	156
16.5	2-15	Rabbit Creek	155
16.5	1-11	Russell Field	155
15	2-95	Wolfe Ridge	146
14	2-3	Hesse Creek	135
13	2-75	Hicks Branch	122
12	1-12	Mollies Ridge	120
11	1-8	Silers Bald	99
10	1-15	Rich Mountain	96

Table 21. Ranks of Legal Campsites by Total Area of Intensive Damage - Cont.

<u>Rank</u>	<u>Site Type and No.</u>	<u>Site Name</u>	<u>Area of Intensive Damage m²</u>
9	2-6	Turkey Pen Ridge	90
8	2-59	McCracken Branch	80
7	2-5	Double Mountain	72
6	2-60	Bumgardner Branch	64
5	2-2	Cane Creek	61
4	2-29	Otter Creek	56
2.5	2-58	Nicks Nest Branch	50
2.5	2-35	Gilliland Creek	50
1	2-19	Upper Henderson	10

Table 22. Ranks of Legal Campsites by Total Area of Bare Soil.

Rank	Site Type* and No.	Site Name	Total Bare Soil m ²
113	2-37	Walnut Bottoms	7247
112	2-13	Sheep Pen Gap	2406
111	2-32	Big Creek (on road)	1889
110	2-22	Old Sugarlands Road (on road)	1260
108.5	2-70	Jonas Creek	1200
108.5	1-3	Tricorner	1200
107	2-24	Rough Creek	1188
106	2-82	Calhoun	1140
105	2-74	Lower Forney	1011
104	2-62	Upper Ripskin	1002
103	2-57	Bryson Place	925
102	2-83	Bone Valley	850
101	1-5	Ice Water Springs	800
100	2-68	Steel Trap	746
99	2-31	Porters Flat	700
98	2-49	Cabin Flats	692
97	2-43	Mt. Chapman	644
96	2-39	Pretty Hollow	640
95	2-69	Huggins	611
93.5	2-27	Lower Jakes Gap	600
93.5	2-9	Anthony Creek	600
92	2-73	Bear Creek	574
91	2-87	Haw Gap	565
90	2-93	Twenty-mile Creek	542
89	2-64	Mill Creek	504
88	1-1	Davenport Gap	500
87	2-91	Upper Lost Cove	490
86	2-10	Ledbetter Ridge	468
85	2-36	Cataloochee (on road)	446
84	2-40	Big Hemlock	438
83	2-41	Caldwell Fork	425
82	2-90	Lost Cove	418
81	2-85	Sawdust Pile	416
80	2-25	Lower Buckeye Gap	414

* Shelters = 1; Campsites = 2

Table 22. Ranks of Legal Campsites by Total Area of Bare Soil.

<u>Rank</u>	<u>Site Type and No.</u>	<u>Site Name</u>	<u>Total Bare Soil m²</u>
79	2-86	Proctor	400
78	2-63	Jerry Flat	396
77	2-96	Eagle Creek Island	380
76	2-71	CCC	375
75	2-81	Proctor Creek	369
74	2-44	McGhee Springs	357
73	2-23	Snakeden Mountain	350
72	1-17	Kephart Prong	320
70.5	2-42	Spruce Mountain	316
70.5	2-65	Bear Pen Branch	316
69	2-21	Medicine Branch Bluff	315
68	2-61	Bald Creek	313
67	2-8	Cades Cove Horse Camp (old)	305
65.5	2-17	Little Bottoms	300
65.5	1-2	Cosby Knob	300
64	2-38	Mt. Sterling	289
62.5	2-55	Pole Road	260
62.5	2-53	Poke Patch	260
60.5	2-88	Pinnacle Creek	240
60.5	2-26	Dripping Springs Mountain	240
59	1-12	Birch Springs	235
58	1-6	Mt. Collins	228
57	1-114	Scott Gap	225
55.5	2-97	Big Walnut	222
55.5	2-92	Upper Flats	222
54	2-50	Lower Chasteen	214
53	2-52	Newton Bald	206
52	2-20	King Branch	200
51	1-7	Double Springs	198
50	2-48	Upper Chasteen	187
49	2-47	Enloe Creek	180
48	2-14	Flint Gap	172
47	2-54	Nettle Creek	170
46	2-12	Ekaneetlee	167
45	1-18	Mt. LeConte	165

Table 22. Ranks of Legal Campsites by Total Area of Bare Soil - Cont.

<u>Rank</u>	<u>Site Type and No.</u>	<u>Site Name</u>	<u>Total Bare Soil m²</u>
44	2-15	Rabbitt Creek	155
43	1-20	False Gap	.150
41.5	1-19	Moore Spring	144
41.5	2-1	Cooper Road	144
39.5	2-67	Goldmine Branch	141
39.5	2-84	Sugar Fork	141
38	2-80	Hazel Creek Cascades	140
37	1-11	Russell Field	135
36	2-94	Long Hungry Ridge	132
35	2-46	Straight Fork	129
34	1-4	Pecks Corner	125
33	1-12	Mollies Ridge	120
32	2-18	West Prong	113
31	2-28	Marks Cove	110
29.5	2-98	Chambers Creek	106
29.5	1-10	Spence Field	106
27.5	2-72	Whiteoak Branch	100
27.5	2-34	Sugar Cove	100
26	1-8	Silers Bald	99
25	2-76	Kirkland Creek	96
23	2-89	Lower Ekaneetlee	90
23	2-11	Beard Cane	90
23	2-95	Wolfe Ridge	90
20.5	2-66	Lower Noland Creek	80
20.5	1-9	Derrick Knob	80
19	2-4	Kelly Gap	77
18	2-5	Double Mountain	72
17	1-15	Rich Mountain	64
16	2-3	Hesse Creek	58
14.5	1-16	Laurel Gap	54
14.5	2-75	Hicks Branch	54
13	2-30	Three Forks	46
12	2-77	(no name on Lake Trail)	42
11	2-19	Upper Henderson	10
10	2-35	Gilliland Creek	8

Table 22. Ranks of Legal Campsites by Total Area of Bare Soil - Cont.

<u>Rank</u>	<u>Site Type and No.</u>	<u>Site Name</u>	<u>Total Bare Soil m²</u>
8.5	2-59	McCraken Branch	6
8.5	2-29	Otter Creek	6
6.5	2-60	Bumgardner Branch	4
6.5	2-56	Burnt Spruce	4
4.5	2-58	Nicks Nest Branch	2
4.5	2-33	Snakeden Mountain	2
2	2-51	Towstring	0
2	2-2	Cane Creek	0
2	2-6	Turkey Pen Ridge	0

LEGAL SITES

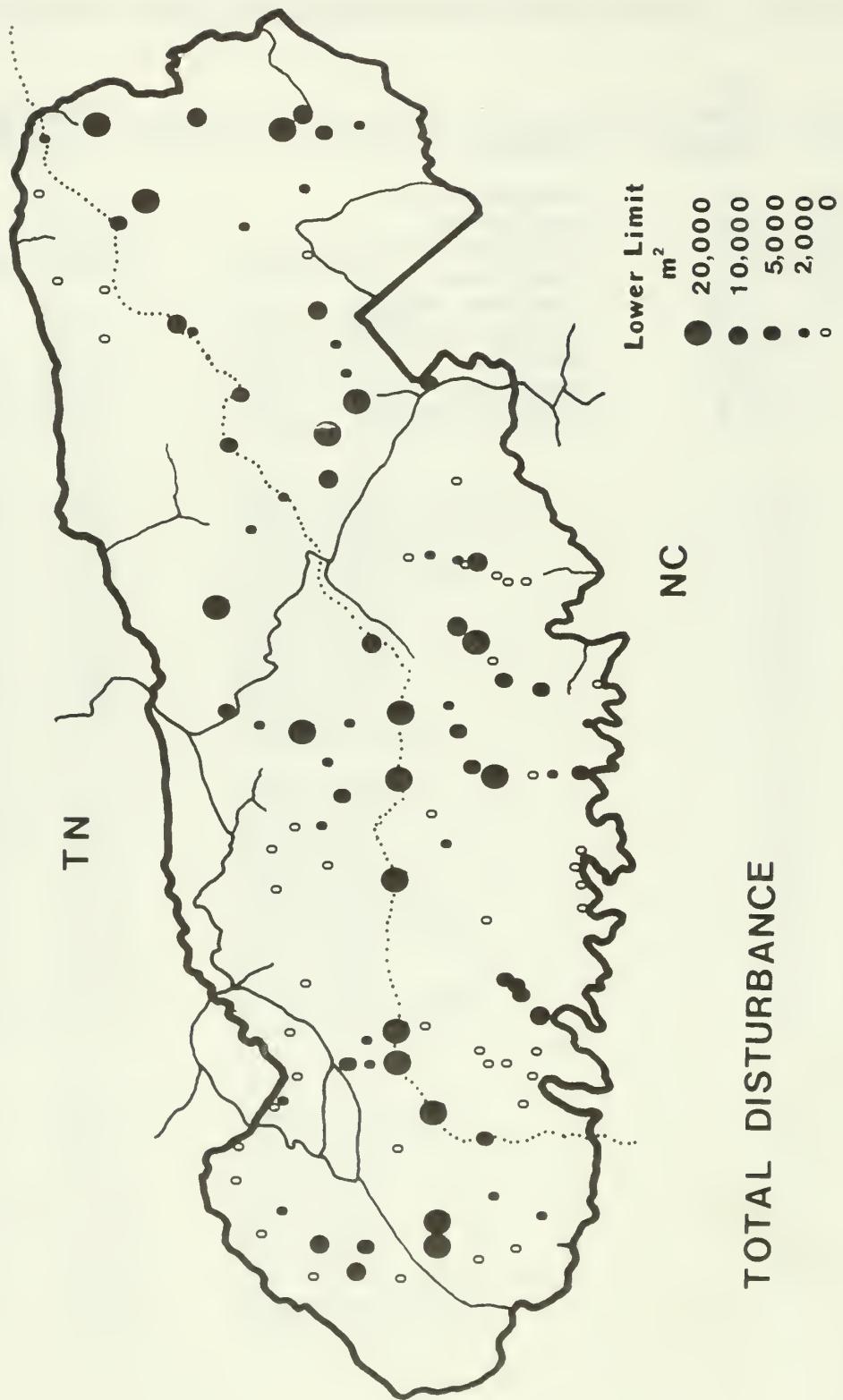


Figure 10.

LEGAL SITES



Figure 11.

Shelters Versus Campsites

An important question, both in light of the recent wilderness proposal and in terms of the general management policies of the park, is the fate of the backcountry shelters. Some hikers are strong advocates of the shelter system and others have campaigned for their removal.

Among the most common objections to shelters are:

1. Shelters attract more backpackers and are used by more inexperienced people. This creates damage, safety and law enforcement problems.
2. Shelters are the most damaged backcountry sites.
3. Shelters have more garbage than other campsites.

Some opinions concerning shelters are in direct contradiction. For instance, it has been stated that they cause safety problems and also stated that they decrease them. Rather than leave all these issues to conjecture, it is possible to construct hypotheses about the relative impacts of shelters and test them with the available data.

Do shelters receive more use?

The answer is obviously yes, on the average, but the most heavily used site in the park in 1976 was a campsite (Walnut Bottoms), and some of the shelters which are not on the Appalachian Trail fall into the moderately used group. Scott Gap and Rich Mountain shelters had less than 200

permitted visitors for June through August 1976, while by way of comparison, at the backcountry campsites in the relatively inaccessible Cataloochee and Big Creek sections had at least 200 permitted nights for the summer months and the most heavily used sites, Mt. Sterling and Walnut Bottoms had 900 and 2,008 visitor nights respectively.

In 1976, the shelters were absorbing over 50 percent of the visitor nights during the winter and about 30 percent to 35 percent during the summer. Since False Gap and Moore Spring were both closed in 1976, and backcountry visitation continued to increase for the whole park, it is likely that the percentage of the total backcountry nights absorbed by shelters in previous years was about 40 percent of the total. Before the overnight permit system was established, this percentage may have been even higher. As previously mentioned, 44 percent of the parties use shelters.

Shelters have almost the same average assigned permit capacity as legal campsites (11.7 versus 11.6) and about the same average permit capacity for horses (8.0 versus 7.9). Shelters, however, represent about 18 percent of the legal backcountry sites (this includes Moore Spring and False Gap). Shelters appear to be carrying about twice the usage per site of other types of sites.

Are shelter sites more damaged than other legal sites?

In terms of total disturbed area, shelters averaged about four times the area of the legal campsites (Table 23a). Shelter sites averaged 2.6 hectares with a maximum of 7.8 hectares, while campsites averaged .62 of a hectare with a maximum of 3.2 hectares. Shelters tend to have less bare soil than other legal sites, and the total intensive damage (including trampled vegetation) is also slightly less. The ratio of total bare soil to total damaged area for shelters is .02, whereas for other legal sites it is .11 (Figure 12). That is, only 2 percent of the disturbed area around a shelter is bare of leaf litter and vegetation. Shelters had more bare rock and slope erosion, on the average, and less mud and fewer firepits (Table 23b).

Shelter sites represent an estimated 41 percent of the total area damaged by camping in the back country (Table 24). They account for considerably less of the bare soil (7 percent) and intensive damage (11 percent). They also have fewer firepits.

Are shelter sites dirtier than other legal sites?

The average trash dispersal around a shelter is over four times greater than that for other legal sites (Table 25a), but this seems to be in proportion to the total size of disturbance. The ratio of trash dispersal to total area is .16 for shelters and .15 for other sites.

Table 23a. Average Area of Different Types of Disturbance per Site for Shelters, Legal Campsites and Illegal Campsites.

<u>Type of Disturbance</u>	<u>Shelters</u>	<u>Legal Campsites</u>	<u>Illegal Campsites</u>
<u>Average Area m²</u>			
Total Disturbance	26,201	6178	424
Firewood Clear	23,789	5941	388
Tree Damage	18,788	3867	193
Trash Dispersal	4,068	917	52
Vegetation Damage	671	800	62
Leaf Litter	285	222	35
Bare Soil	189	405	47
Mud	7	15	2
Bare Rock	29	7	1
Slope Erosion	45	12	1
Total Bare	557	660	87
Total Intensive Damage	1,228	1460	148
<u>Ratio</u>			
Total Bare/Total Area	.02	.11	.21
Total Intensive/Total Area	.05	.24	.35
Trash/Total Area	.16	.15	.12

Figure 12.

A comparison of shelters and legal campsites.

Note the low amount of bare soil for shelters relative to the total amount of damage.

TREMONT - ELMONT

TREE DAMAGE VS. BARF SOIL, LEGAL SITES (M-2)

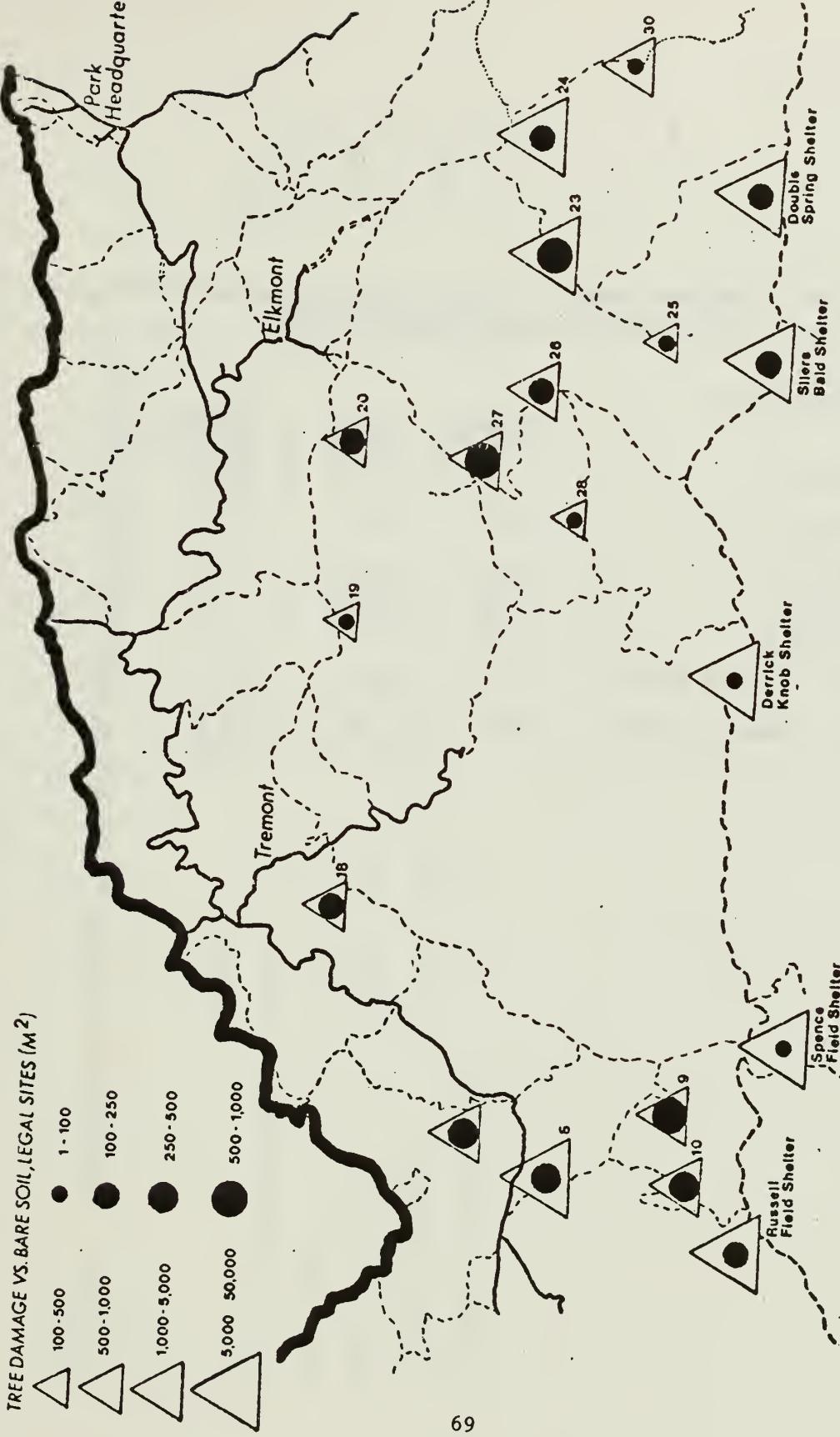


Figure 12.

Table 23b. Average Number of Firepits and Developments for Shelters,
Legal Campsites and Illegal Campsites.

Average per Site		<u>Shelters</u>	<u>Legals</u>	<u>Illegals</u>
Fireplaces		.84	.33	.01
Fire Pits		2.31	4.67	1.23
All Fires		3.15	5.00	1.24
Developments		3.68	1.63	.05
Permit	Capacity People	11.7	11.6	0.
Permit	Capacity Horses	8.0	7.9	0.

Table 24. Percentage of Different Types of Disturbance by Type of Campsite.

	<u>Shelters</u>	<u>Legal Campsites</u>	<u>Illegal Campsites</u>	<u>Total</u>
Total Disturbed Area m^2	497,825 (41%)	580,765 (48%)	122,633 (10%)	1,201,223
Bare Soil m^2	3,599 (7%)	38,032 (69%)	13,656 (25%)	55,287
No Vegetation m^2	10,580 (11%)	62,037 (64%)	25,062 (26%)	97,679
Intensive Damage m^2	23,335 (11%)	137,225 (67%)	42,848 (21%)	203,408
Firepits and Fireplaces	60 (7%)	470 (53%)	359 (40%)	889

The average field ratings for shelters give a substantially poorer rating for trash and are also lower for mud and dirt and vegetation damage, despite the fact that the area of exposed soil tends to be lower than that for other legal sites (Table 25). Sanitation is slightly better for shelters and placement and drainage are about the same (Table 25). Shelters tend to have moderate ratings for mud and dirt (3's), rather than good (1-2) or poor (4-5), and poor ratings for wood availability, trash and vegetation damage. Placement and drainage for all types of sites tend to be good.

Do environmental variables have a role in the condition and placement of shelters?

The average elevation for shelters is almost 2,000 feet greater than other legal campsites (4,781 feet versus 2,818 feet) and the average slope is about 2 degrees greater (4.9 degrees versus 2.8 degrees). Seventy-five percent of the shelters are above 4,000 feet while only 13 percent of the other legal campsites are (Table 27). Shelters are almost always on slopes, ridge tops or gaps, while other sites are more frequently on creek flats (Table 28).

Shelters are more frequent in spruce-fir (which is a forest type very sensitive to erosion) and in northern hardwoods. A noticeable trend, although not one which may be approached statistically with

Table 25. Average Values of Field Ratings for Shelters, Legal Campsites, and Illegal Campsites.

	<u>Shelters</u>	<u>Legal Campsites</u>	<u>Illegal Campsites</u>
Number of Sites	19	94	289
<u>Field Ratings</u>			
Frequency of Use	4.52	3.34	1.75
Carrying Capacity	3.95	3.09	2.88
Firewood	3.95	3.23	2.06
Trash	3.68	2.41	1.21
Mud and Dirt	3.05	2.90	1.83
Vegetation Damage	3.79	3.05	2.04
Sanitation	2.53	2.70	2.51
Placement	2.11	2.16	2.93
Drainage	1.58	1.59	1.55

Table 26. Field Ratings for Shelters Versus Other Legal Campsites.

<u>Field Rating</u>	<u>Site Type</u>	Good or Low 1-2	Fair or Moderate 3	High or Poor 4-5
Carrying Capacity $\chi^2 = 10.29$ $p < .01$	Shelter Other	1(5%) 22(24%)	8(40%) 51(55%)	11(55%) 20(22%)
Frequency Use $\chi^2 = 21.12$ $p < .005$	Shelter Other	0(0%) 20(22%)	1(5%) 34(37%)	19(95%) 39(42%)
Wood Gathering $\chi^2 = 6.82$ $p < .05$	Shelter Other	0(0%) 19(20%)	8(40%) 42(45%)	12(60%) 32(34%)
Trash Dispersal $\chi^2 = 24.48$ $p < .005$	Shelter Other	2(10%) 52(56%)	7(35%) 31(33%)	11(55%) 10(11%)
Mud and Dirt $\chi^2 = 2.2$ $p < .75$	Shelter Other	3(15%) 25(27%)	14(70%) 48(52%)	3(15%) 20(22%)
Vegetation Damage $\chi^2 = 9.21$ $p < .01$	Shelter Other	1(5%) 24(26%)	7(35%) 44(47%)	12(60%) 25(27%)
Sanitation $\chi^2 = .33$ $p < .75$	Shelter Other	6(30%) 38(41%)	9(45%) 36(37%)	3(15%) 18(19%)
Placement $\chi^2 = .19$ $p < .90$	Shelter Other	14(70%) 65(70%)	4(20%) 16(17%)	2(10%) 12(13%)
Drainage $\chi^2 = 2.53$ $p < .25$	Shelter Other	11(55%) 45(48%)	6(30%) 42(45%)	3(15%) 6(6%)

Table 27. Elevation and Slope by the Type of Campsite.

	<u>Shelters</u>	<u>Legal Campsites</u>	<u>Illegal Campsites</u>
Average Elevation (ft.)	4781	2818	3485
Average Slope Degree	4.89	2.84	2.85

Table 28. Differences in Placement Between Shelters and Other Legal Campsites.

Distance from road	Miles			
	≤1	1 - 3	3 - 5	>5
$\chi^2 = .72$				
$P < .9$				
Not significant				
Shelters	2 (10%)	4 (20%)	7 (35%)	7 (35%)
Other legals	12 (13%)	12 (13%)	32 (34%)	37 (40%)

Topography	Type			
	Ridge-top	Gap	Slope	Stream Flat
$\chi^2 = 39.56$				
$P < .005$				
Highly significant				
Shelters	6 (30%)	10 (50%)	3 (15%)	1 (5%)
Other legals	4 (4%)	11 (12%)	6 (6%)	72 (77%)

Elevation	Feet		
	<3000	3000 - 4999	≥5000
$\chi^2 = 37.47$			
$P < .005$			
Highly significant			
Shelters	2 (10%)	6 (30%)	12 (60%)
Other legals	57 (61%)	30 (32%)	6 (6%)

the present data, is the high rank of the shelters in deciduous forest in terms of total area and the relatively high rank of shelters from spruce-fir and areas of steep slopes in terms of intensive damage. The seven shelters on the ridge top from Double Springs to Moore Spring all are in the top 12 for total damage, Tricorner, Ice Water Springs, Mt. Collins, Pecks Corner, False Gap and Kephart tend to be lower on the list (Table 20). In terms of bare soil, however, Tricorner and Ice Water Springs have the highest values of any shelters. Davenport Gap, Cosby Knob, Kephart and Mt. Collins also tend to have large areas of bare soil (Table 22). Although investigator differences could play a role in these results, it seems likely that the steep slopes and heavy understories in areas like those around Tricorner tend to concentrate visitor activities around the shelter. Intensive damage like trampling is greater and extensive damage like firewood gathering is less at these sites. A more careful survey would be necessary to determine the exact differences in damage between deciduous and spruce-fir vegetation. The beech forests and grassy balds may also produce less firewood per unit area, which would force campers to go further to gather wood.

Despite their high use, shelters are not necessarily any closer to the road than legal campsites (Table 28). The shelters closest to the road are not necessarily the most extensively damaged.

Are there differences in sanitation between shelters and campsites?

More shelters have outhouses but shelters also tend to have springs as water sources. Small streams and springs are far more likely to be heavily contaminated by bacteria (Silsbee et al 1977). If water sources with low class values are most likely to be contaminated, the shelter sites are more likely to have problems. The high concentrated use around shelters probably increases the risk.

The Relationship of Visitation to Campsite Condition

Visitation is the primary factor in campsite damage and deterioration. Since visitation is a variable that can be controlled, it would be useful to know what levels of usage sites can tolerate before they become muddy, or suffer intense vegetation damage, or accumulate trash and bear problems. The following discussion attempts to determine which levels of visitation cause extensive deterioration.

Since campsites and shelters have different patterns of damage, they have been analyzed separately as well as together. Table 29 shows the correlation coefficients between visitor nights and site factors.

Visitation is positively related to elevation (Figure 13), especially in the case of shelters ($CC=.77$). There is also some relation to legal permit capacity, but the correlation is weaker than would be expected if designated site capacities were strongly influencing visitation. The correlation is higher for shelters, where the limits have been more strictly enforced than for campsites. Distance from the road shows no significant positive or negative correlation (Figure 14). Number of developments is not correlated to visitation for campsites alone or shelters alone, but when the two are merged there is a significant correlation, presumably due to the higher use of shelters.

For campsites, damaged area is very closely correlated to visitation (Table 30). Total bare soil and fire pits show the greatest correlation

Table 29. Correlations Between Visitor Nights and Site Factors
(74 - 76 Average Visitation).

<u>Factor</u>	<u>Camps Only</u>	<u>Shelters</u>	<u>Both</u>
Elevation	.29*	.77*	.62*
Permit Capacity	.39*	.54*	.31*
Distance from the Road	-.16	.07	-.10
Developments	.10	.14	.27*

* are significant at $p > .01$

Figures 13. and 14.

The relationship of visitation to site conditions

Visitation is the total number of legal visitor nights per site. Elevation is in feet, distance from the road is by classes (see methods section), the greatest distance being 9. Figure 13 is shelters only; Figure 14 is campsites only.

Figure 13.

SHELTERS

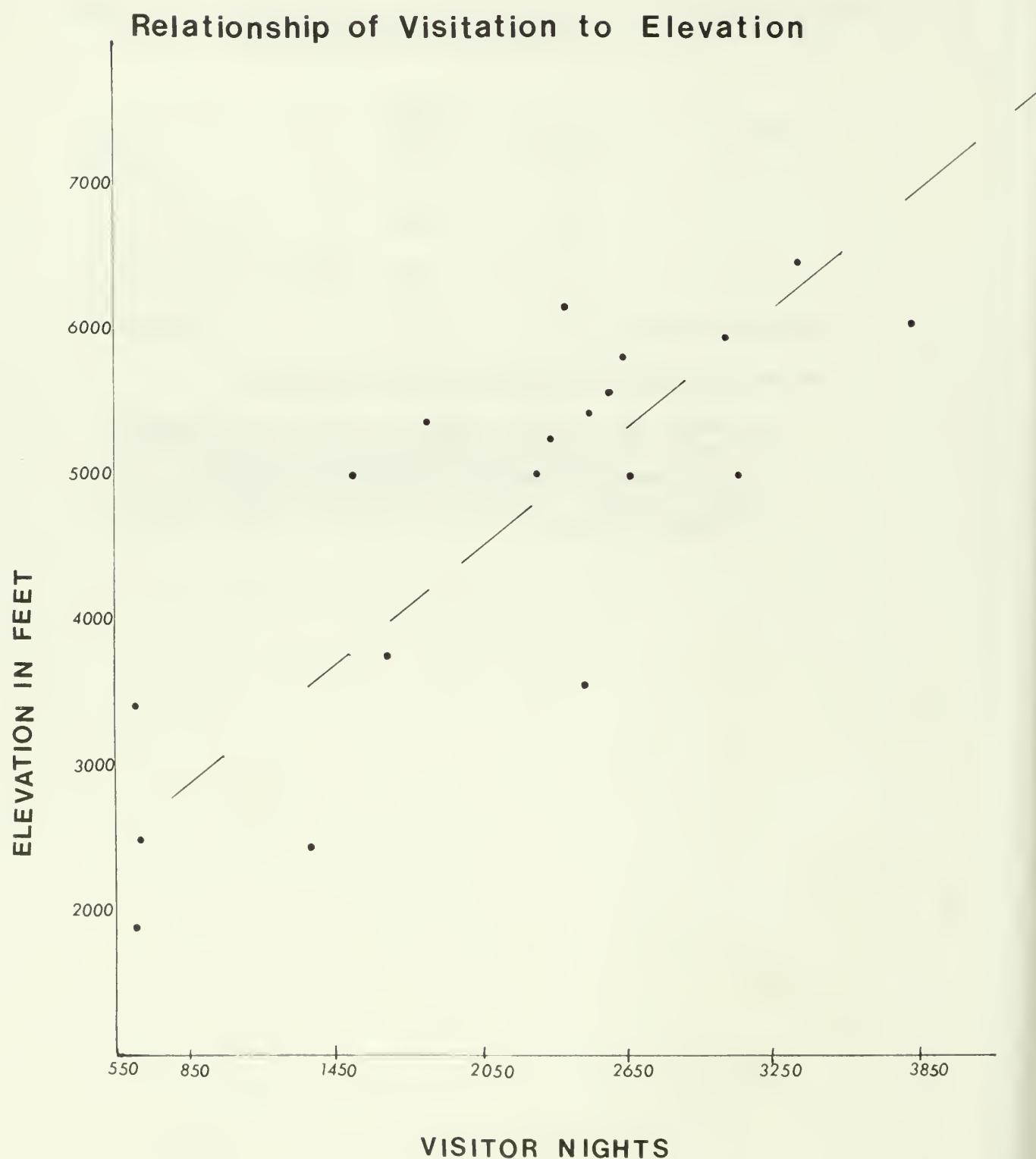


Figure 14.

CAMPsites

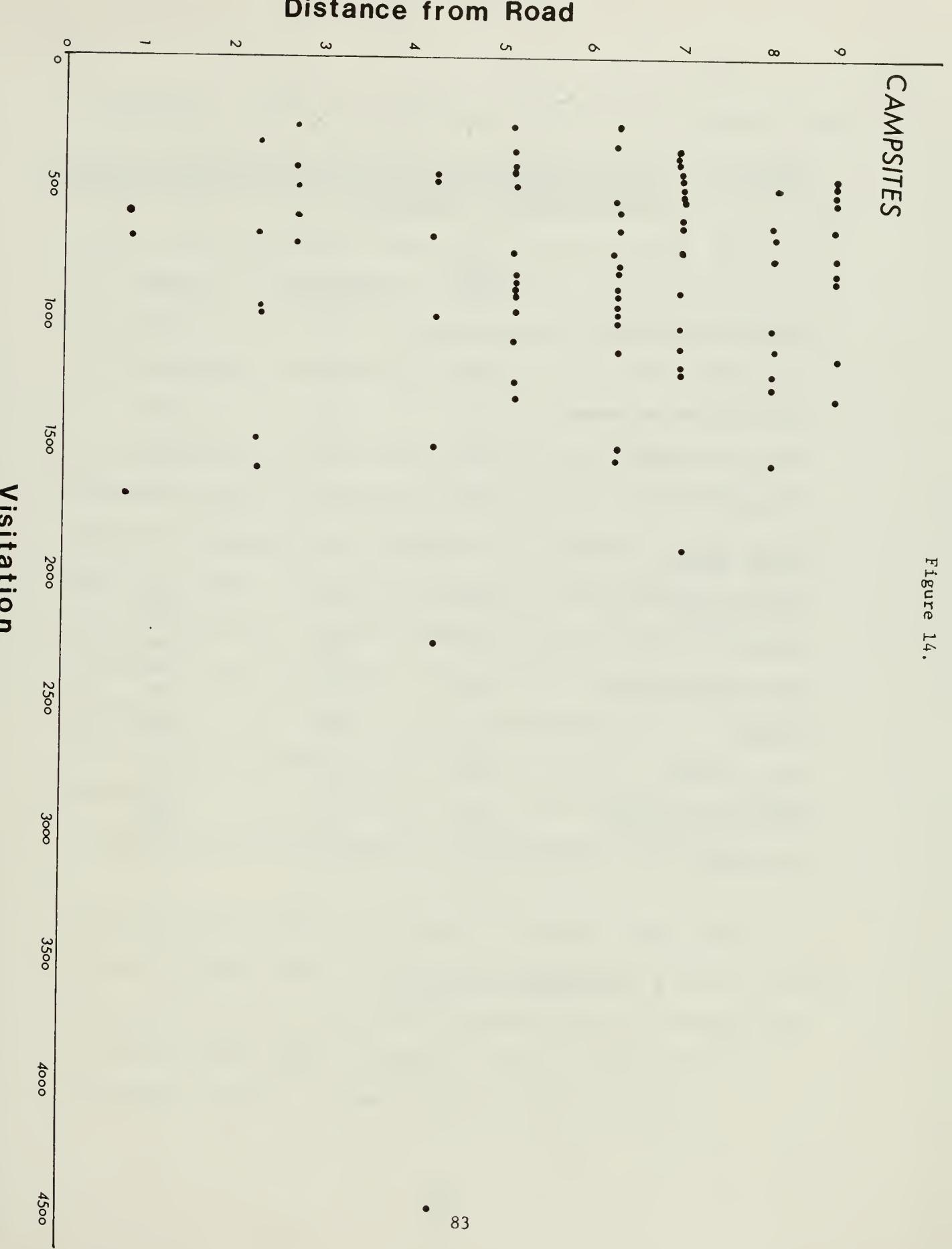


Table 30. Correlations Between Visitor Nights and Site Disturbance (74 - 76 Average Visitation).

	<u>Camps Only</u>	<u>Shelters</u>	<u>Both</u>
Total Disturbed Area	.62*	.24	.60*
Total Bare Soil	.78*	.23	.45*
Total Intensive Damage	.68*	.09	.39*
Total Area Trash	.47*	.27	.52*
Total Firepits	.79*	.62*	.44*

Field Ratings

Carrying Capacity	.36*	.44	.50*
Frequency Use	.53*	.69*	.66*
Wood Availability	.44*	.14	.46*
Trash	.31*	.21	.45*
Mud and Dirt	.38*	-.21	.22
Vegetation Damage	.54*	.37	.58*
Sanitation	-.04	.24	.02

* significant at $p > .01$

coefficients (.78 and .79 respectively). In the case of shelters, there are no significant correlations of visitation to any types of damage except number of firepits (CC=.62). In the case of shelters (with their tightly concentrated use), forest type, drainage, history and even the position of the water source may be more important in determining factors like area of bare soil than visitation is, especially when the shelter receives over 1,000 visitor nights a year.

The correlations to field ratings are also shown in Table 30. The observers estimates of frequency of use were relatively accurate (CC=.66). This means that visitors can also recognize a heavily used site quite easily. Sanitation was the only field rating that showed little relationship to visitor nights. Small sites were frequently given poor sanitation ratings if the site was immediately next to a spring or other water source. It is interesting that the correlations with the field ratings tend to be lower than those for actual measurements of factors like bare soil. Field ratings tend to be more strongly influenced by topography and investigator preferences.

Using linear regression, it is possible to construct some simple predictive models based on visitation for campsites. With the exception of number of firepits, significant regressions were not obtained for visitation versus damage for shelters. Using visitation as the independent variable, the regressions are shown in Table 31.

Table 31. Regressions of Damage on Visitation x = Visitor Nights.

		Std. error	Std.	
	<u>Intercept</u>	<u>Error x</u>	<u>R-sq.</u>	
<u>Campsites Only</u>				
Total Area m^2 = 61.4 + 8.36(x)	1152.	1.27	.34	
Area Wood Gathering m^2 = -32.8 + 8.88(x)	1110.	1.22	.38	
Bare Soil m^2 = -253.6 + 1.04(x)	83.	.09	.60	
Total Fires = 1.05 + .006(x)	.45	.0005	.63	
<u>All Sites</u>				
Total Area m^2 = -311.3 + 10.2(x)	1709.	1.34	.36	
Area Wood Gathering m^2 = 52.9 + 9.15(x)	1738.	1.36	.31	
Intensive Damage m^2 = 416 + 1.06(x)	313.	.25	.15	
Bare Soil m^2 = 46.1 + .39(x)	98.	.07	.20	
Total Fires = 2.66 + .002(x)	.57	.0004	.19	
<u>Shelters Only</u>				
Total Fires = -1.19 + .001(x)	1.46	.0006	.39	

Figures 15 and 16 show the relationship of bare soil and fire pits to visitation. Note that the regressions for total damage and wood gathering are close to and probably should go through the origin. The regression for bare soil crosses the abscissa at about 250 visitors. This is probably realistic; at very low levels of visitation there may be almost no bare soil. All the legal sites have at least one firepit, so the curve for fires crosses the ordinate at about one rather than at zero. The regressions indicate that for each additional visitor night added, one should expect an additional 8.9 square meters of total disturbance and 1.0 square meters of bare soil. Each 300 additional visitor nights adds about two additional firepits on the average. Using both the campsite and shelter data together leads to similar regressions for wood gathering and total area, but provides rather weak (low R-square) regressions for bare soil and firepits.

In the campsites, only regressions during recent visitation (a 1974, 1976 average) account for about 60 percent of the variance in the amount of bare soil and the number of firepits. Considering the differences in forest type and drainage between campsites, and the potential for investigator error in both variables, the number of permit nights is a very good predictor of local disturbance.

Looking at the site field ratings, some patterns associated with usage are evident (Tables 32 and 33). No very high usage sites (>1000) had any firewood available near the sites, and the sites in the 600-1000 range tend to be largely firewood clear. Sites with less than 400

Figures 15 and 16.

The relationship of visitation to damage.

Visitation is shown as legal number of permitted visitor nights per site. Bare soil is square meters of area without vegetation. Both figures are for campsites only. Total fires is fire pits plus fireplaces.

CAMPSITE DAMAGE

Figure 15.

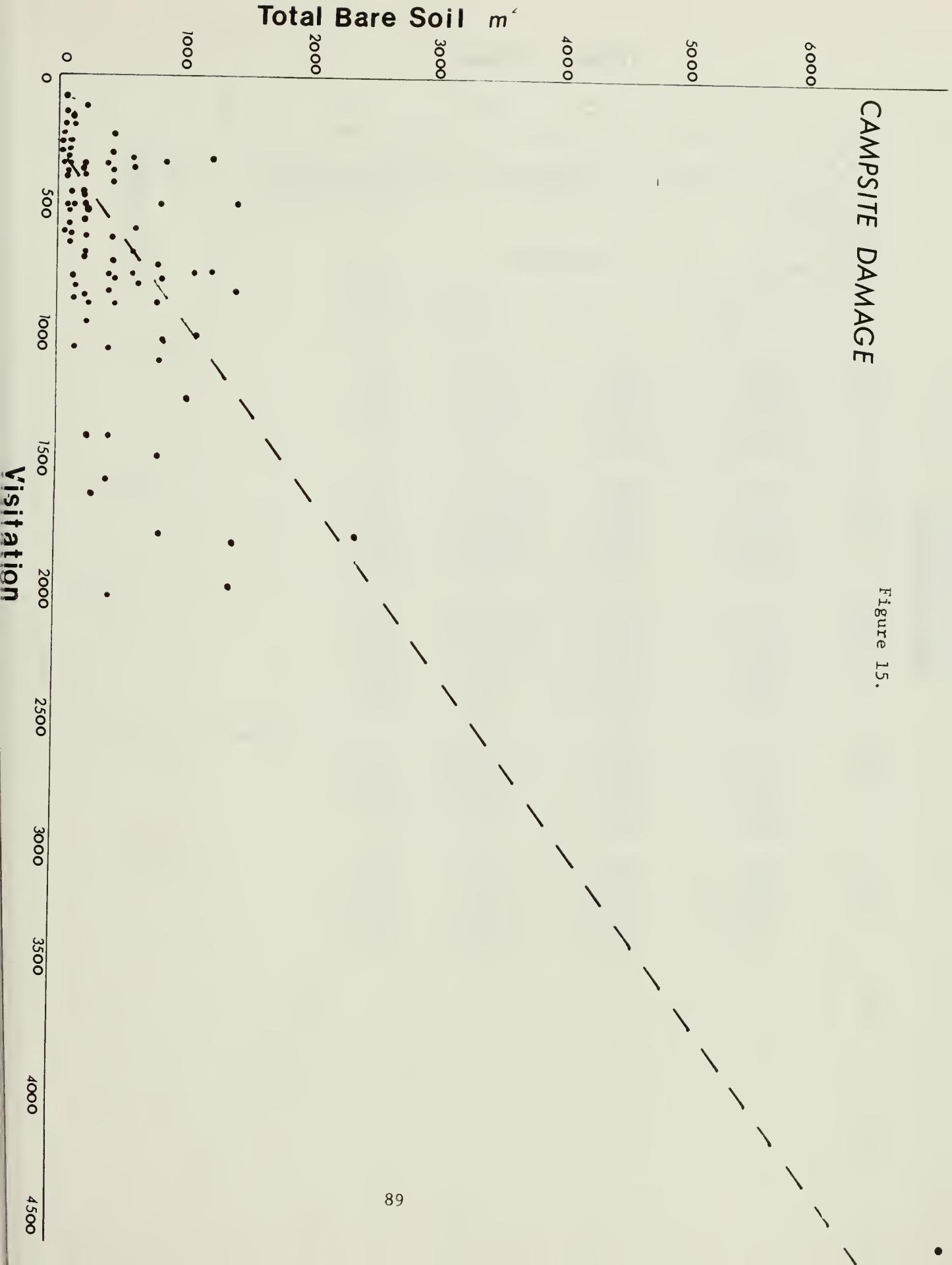


Figure 16.

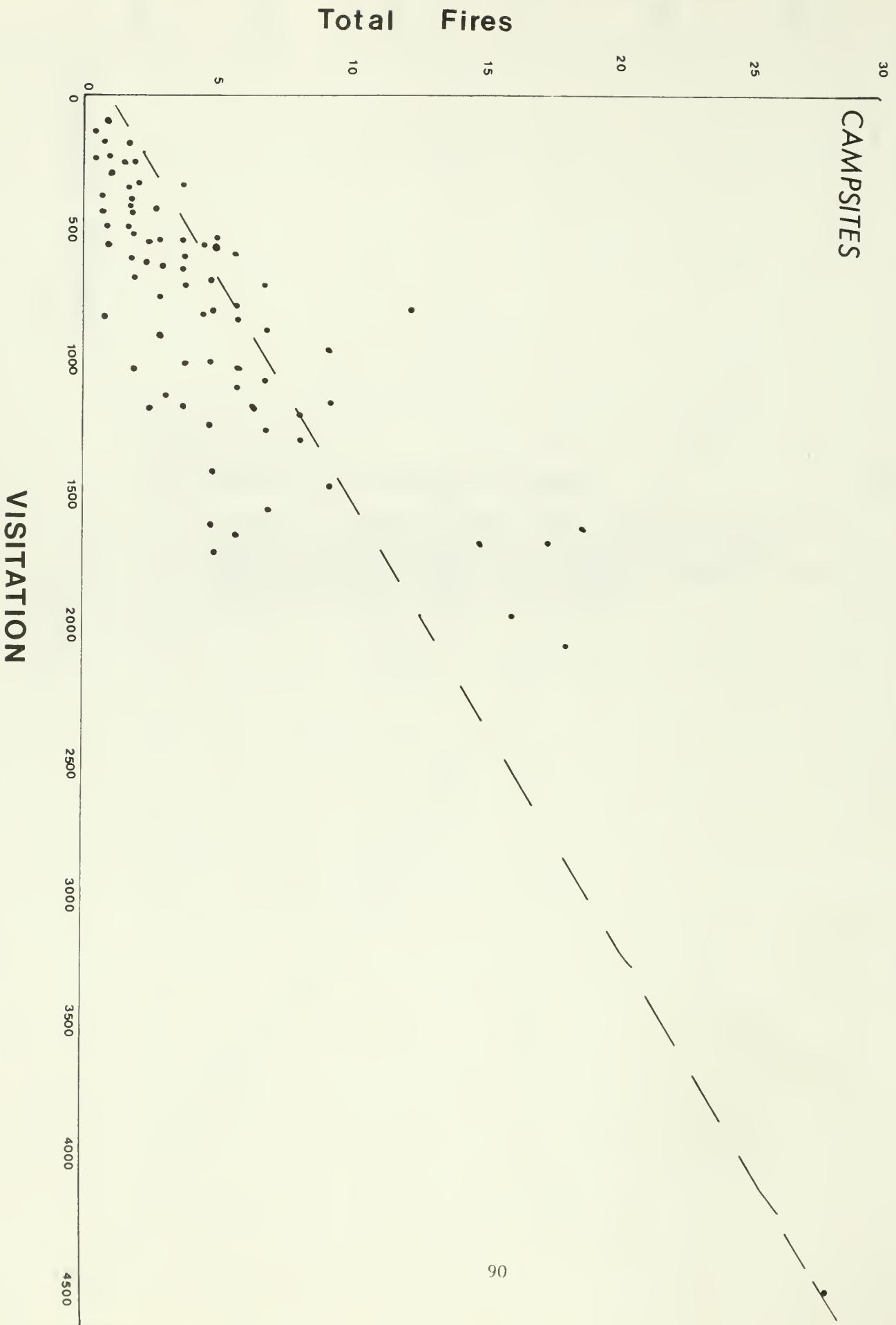


Table 32 . The Relationship of Field Ratings to Visitation -
Campsites Only.

Visitor Nights	74 - 76	Field Rating		
		Good	Fair	Poor
		<u>Average</u>	<u>0-2</u>	<u>3</u>
Firewood	≤ 200	8 (67%)	3 (25%)	1 (8%)
	≤ 400	3 (14%)	15 (68%)	4 (18%)
	≤ 600	4 (29%)	6 (43%)	4 (29%)
	≤ 1000	4 (17%)	10 (42%)	10 (42%)
	> 1000	0 (0%)	5 (33%)	10 (67%)
Trash	≤ 200	9 (75%)	3 (25%)	0 (0%)
	≤ 400	14 (64%)	8 (36%)	0 (0%)
	≤ 600	8 (57%)	4 (29%)	2 (14%)
	≤ 1000	11 (46%)	8 (33%)	5 (21%)
	> 1000	6 (40%)	6 (40%)	3 (20%)
Mud	≤ 200	6 (50%)	6 (50%)	0 (0%)
	≤ 400	10 (45%)	10 (45%)	2 (10%)
	≤ 600	3 (21%)	9 (64%)	2 (14%)
	≤ 1000	3 (13%)	13 (54%)	8 (33%)
	> 1000	1 (7%)	8 (53%)	6 (40%)
Vegetation Damage	≤ 200	5 (42%)	7 (58%)	0 (0%)
	≤ 400	9 (41%)	12 (55%)	1 (4%)
	≤ 600	3 (21%)	8 (57%)	3 (21%)
	≤ 1000	5 (21%)	11 (46%)	8 (33%)
	> 1000	1 (7%)	3 (20%)	11 (73%)
Sanitation	≤ 200	4 (33%)	4 (33%)	4 (33%)
	≤ 400	9 (41%)	8 (34%)	5 (23%)
	≤ 600	5 (36%)	7 (50%)	2 (14%)
	≤ 1000	11 (46%)	12 (50%)	1 (4%)
	> 1000	7 (47%)	4 (27%)	4 (27%)

Table 33 . The Relationship of Field Ratings to Visitation - All Legal Sites (only compatible factors included).

<u>Visitor Nights</u>		<u>Field Rating</u>		
		<u>Good</u> <u>0-2</u>	<u>Fair</u> <u>3</u>	<u>Poor</u> <u>4-5</u>
Firewood				
≤ 200	8 (67%)	3 (25%)	1 (8%)	
≤ 400	3 (14%)	15 (68%)	4 (18%)	
≤ 600	4 (27%)	7 (47%)	4 (27%)	
≤ 1000	4 (16%)	11 (44%)	10 (40%)	
> 1000	0 (0%)	10 (32%)	21 (68%)	
Trash				
≤ 200	9 (75%)	3 (25%)	0 (0%)	
≤ 400	14 (64%)	8 (26%)	0 (0%)	
≤ 600	9 (60%)	4 (27%)	2 (13%)	
≤ 1000	11 (44%)	8 (32%)	6 (24%)	
> 1000	7 (23%)	12 (39%)	12 (39%)	
Vegetation Damage				
≤ 200	5 (42%)	7 (58%)	0 (0%)	
≤ 400	9 (41%)	12 (55%)	1 (4%)	
≤ 600	3 (20%)	9 (60%)	3 (20%)	
≤ 1000	5 (20%)	12 (48%)	8 (32%)	
> 1000	2 (6%)	7 (23%)	22 (71%)	

visitor nights all had good to fair trash ratings. None of the low use sites had large amounts of garbage dispersed around the perifery of the camp. In the case of both mud and vegetation damage, only four sites with less than 600 visitor nights had poor ratings, while only four sites with over 600 visitor nights had good ratings for mud. A description of an "average" site at each of several visitation levels is shown in Table 34. In general, visitation of less than 400 nights will keep almost all the sites in the park in good condition. A few sites begin to develop problems between 400-600 visitors. Physical carrying capacity for most sites is between 600 and 1,000 visitors. Over 1,000 visitor nights almost certainly implies trash problems and also means intensive firewood gathering and vegetation damage.

A table (35) from Black Bear Management in Great Smoky Mountains National Park (Singer and Bratton 1977), is included for comparative purposes. Note that, as in the case with trash, sites with less than 400 visitor nights a year do not have problems. Sites in the 400 to 1,000 range have moderate problems (often depending on site position), and sites with over 1,000 visitor nights per year have a very high bear incident rate.

Finally, we need to look at the relationship between usage and some qualities of the trail system in the park. Table 36 shows the relationship between usage and the presence and trail intersections. More

Table 34. Expected Qualities for Campsites with Varying Degrees of Visitation.

- ≤ 200 - This site may have little or no bare soil. Firewood can be found in the camp and there is little or no trash. Vegetation damage will be moderate.
- ≤ 400 - This site will probably have bare soil in the center. There will not be much wood in the camp but it should be available around the edges. There will be little trash. Vegetation damage will be moderate.
- ≤ 600 - This site will have a moderate bare area at the center and may be muddy if poorly drained. There will be firewood around the edge of the camp. There may be trash. Most of the neighboring vegetation will be trampled.
- ≤ 1000 - This site will have an extensive area of bare soil, several firepits and tent sites. Firewood will be scarce immediately around the camp and it will be necessary to go into the surrounding forest to get it. Vegetation damage will be noticeable and the site is likely to be trashy.
- > 1000 - There will probably be enough bare soil and mud that finding a clean tenting site may be difficult. The site is likely to be trashy. Firewood gathering will be difficult and may require a long walk down the trail. Vegetation damage will be intense.

Table 35. The Occurrence of Black Bear Incidents in 1975 and 1976
at Backcountry Sites with High, Moderate, and Low
Incidence of Visitor Nights

	<u>Backcountry Sites</u>			<u>Total</u>
	<u>High Visitor Use (>1000)</u>	<u>Moderate Use (1000-400)</u>	<u>Low Use (<400)</u>	
Sites with Reported Bear Incidents	15 (65%)	8 (35%)	0	23 (100%)
Sites without Reported Bear Incidents	18 (21%)	28 (32%)	41 (47%)	87 (100%)

high use sites are at intersections. More high use sites have open canopies, probably a matter of being at intersections and of human damage to the canopy.

Perhaps of more interest is the relationship of permit capacity to usage (Table 38). As already mentioned, the two factors are positively correlated, but the variation is rather high. Although none of the very low use sites have high permit capacities, a number of high use sites have lower capacities. In some cases then, the present permit capacities are not effectively limiting site use. Fourteen sites with official capacities of six to eight are receiving over 600 visitor nights a year.

Table 36. Physical Characteristics of Sites by Usage, Presence of Trail Intersection, Presence of Open Canopy.

Average No.
Visitor Nights
1974 and 1976

	<u>At Intersection</u>	<u>No Intersection</u>
≤ 200	0 (0%)	12 (100%)
≤ 400	5 (23%)	17 (77%)
≤ 600	6 (43%)	8 (57%)
≤ 1000	5 (26%)	14 (74%)
> 1000	7 (47%)	8 (53%)
	<u>Canopy Closed</u>	<u>Canopy Open</u>
≤ 200	11 (92%)	1 (8%)
≤ 400	14 (64%)	8 (36%)
≤ 600	11 (79%)	3 (21%)
≤ 1000	16 (67%)	8 (33%)
> 1000	8 (53%)	7 (47%)

Table 38. The Relationship of Official Permit Capacities to Actual Visitor Use, Averaged Total Permitted Nights 1974 and 1976 (Shelters 1976).

<u>Average Visitor Nights per Year</u>	<u>Official 1976 Permit Capacity</u>				<u>Total</u>
	<u>6-8</u>	<u>10-12</u>	<u>14-20</u>		
<u>Campsites Only</u>					
≤ 200	4 (33%)	8 (67%)	0 (0%)		12
≤ 400	12 (55%)	6 (27%)	4 (18%)		22
≤ 600	1 (7%)	7 (50%)	6 (43%)		14
≤ 1000	9 (38%)	10 (42%)	5 (21%)		24
> 1000	4 (27%)	5 (33%)	6 (40%)		15
 <u>Campsites and Shelters</u>					
≤ 600	2 (13%)	7 (47%)	6 (40%)		
≤ 1000	10 (40%)	10 (40%)	5 (20%)		
> 1000	4 (13%)	18 (58%)	9 (29%)		

Relationships Between Legal and Illegal Campsites and Environmental Factors.

Since visitation is correlated to environmental variables such as elevation, it is somewhat difficult to determine the importance of certain environmental factors alone. Some relationships can be established, however. Distance from the road, for instance, is a variable which is often implicated in the origin of problem areas. As Table 39 shows, illegal campsites are not clustered near the trail heads, but tend to be most common about 5 miles from the road. Large illegal sites (greater than 200 square meters) actually tend to be further from the road than smaller illegal sites, but there are no significant correlations between the area of legal or illegal sites and distance from the road (Table 40).

Elevation, which is significantly correlated to visitation, is only significantly correlated to the area damaged when campsites and shelters are considered together. The greatest damage is at the highest elevations (Table 41). There are proportionately fewer illegal sites than legals at the lowest elevations (Table 39), but this difference is not statistically significant at the .05 percent level.

Legal and illegal sites are differently placed in relation to topography. Legal sites are more frequently established on creek

Table 39. Differences in Placement Between Legal and Illegal Campsites.

Distance from road		Miles					
		≤1	1 - 3	3 - 5	>5		
$\chi^2 = 7.61$	$p < .07$	Legals	13 (12%)	16 (14%)	39 (35%)	45 (40%)	
		Illegal	39 (13%)	74 (26%)	88 (30%)	88 (30%)	
Illegal		≥200 m ² Area	15 (10%)	32 (21%)	45 (30%)	60 (39%)	
Distance from road -All classes							
		≤1	≤2	≤3	≤4	≤5	≤12
Miles							
Legals	6	7	7	9	16	23	10
Percent	(5%)	(6%)	(6%)	(8%)	(14%)	(20%)	(9%)
Illegal	27	12	30	44	41	47	9
Percent	(9%)	(4%)	(10%)	(15%)	(14%)	(16%)	(3%)
Topography							
		Legal	10 (9%)	21 (19%)	Slope	Stream flat	
		Illegal	55 (19%)	45 (16%)	31 (11%)	73 (65%)	135 (47%)
Elevation							
		Feet	≤2000	≤3000	≤4000	<5000	<6000
$\chi^2 = 10.37$	$p < .07$	Legal	23	36	28	8	15
			(20%)	(32%)	(25%)	(7%)	(13%)
Illegal		Illegal	36	81	73	52	39
			(12%)	(28%)	(25%)	(18%)	(13%)
							≤6000
							3
							(3%)
							8
							(3%)

Table 40 . Correlation Between Distance and the Area of Damage.

<u>Distance vs. Total Area m²</u>	<u>Legal Campsites</u>	<u>All Legals</u>	<u>Illegals</u>
Total Area m ²	-.10	.05	.04
Area of Trash m ²	.04	.12	.10
Bare Soil m ²	.02	.02	.08
Intensive Damage	-.06	-.02	.07

None of the above are significant.

Table 41. Correlation Between Elevation and Damage

<u>Elevation vs.</u>	<u>Legal Campsites Only</u>	<u>Legal Sites</u>	<u>Illegal Sites</u>
Total Area m^2	.09	.39**	.12
Areas of Trash m^2	.05	.32**	.12*
Bare Soil m^2	.07	.01	.002
Intensive Damage m^2	.05	.03	-.02

* p > .05

** p > .01

flats and illegal sites are more common on slopes or ridge tops. Table 42 shows, however, that the largest illegal sites are on creek flats, and the difference is statistically significant at the .05 level. Trail patrol needs to be aware that a majority of the heavily used, chronic illegal sites are beside streams.

Visitation at legal sites is positively influenced by the presence of a trail intersection, and so is the total area of damage around legal campsites (Tables 43 and 44). More shelters than campsites are at trail intersections. The size of illegal sites shows no significant relationship to the presence or absence of a trail intersection (Table 45). Most of the largest illegal sites are not at intersections.

Table 43 shows the percentages of various types of sites with open canopy. About a third of the legal sites have open or partially open canopies and about a quarter of the illegal sites are open. This probably represents user choice as well as damage. Balds and open areas on ridge tops frequently support small illegal sites. Some of the canopy opening is due to tree cutting and recent human impacts. Large sites tend to be open and repression of succession may be occurring in some places. Permanent vegetation plots would be necessary to properly describe these trends. The total percentage of sites with some canopy open is high, 26 percent.

Table 42. The Relationship Between the Total Disturbed Area of Illegal Sites and Topographic Position.

Total Size m ²	Topography				Total
	Ridge Top	Gap	Slope	Stream Flat	
≤ 10	6	14	8	11	39
Expected	7.7	6.3	7.1	17.5	
≤ 50	25	17	18	37	97
Expected	18.7	15.3	17.3	45.9	
≤ 200	14	5	18	37	74
Expected	14.3	11.7	13.3	35.1	
≤ 1000	10	7	6	33	56
Expected	11.0	9.0	10.2	27.0	
> 1000	0	2	1	17	20
Expected	3.9	3.2	3.6	8.8	
Total	55	45	51	135	

$$\chi^2 = 39.5 \quad p < .005$$

Table 43. The Relationship of Campsite Type to Trail Intersections and Open Canopy.

Presence of trail intersection at the site

	<u>Intersection</u>	<u>No Intersection</u>
Shelters	14 (60%)	6 (30%)
Legal campsites	30 (32%)	63 (68%)
All legal sites	44 (39%)	69 (61%)
Illegal sites	57 (20%)	232 (80%)

Canopy open or partially open at the site

	<u>Open Canopy</u>	<u>Closed Canopy</u>
Shelters	7 (35%)	13 (65%)
Legal campsites	28 (30%)	65 (70%)
All legal sites	35 (31%)	78 (69%)
Illegal sites	69 (24%)	220 (76%)
Total	104 (26%)	298 (74%)

Table 44. The Relationship of Legal Campsite Size to the Presence of a Trail Intersection.

Legal Campsites	Size m ²	Intersection	No Intersection
$\chi^2 = 11.37$	≤ 500	5	18
$p < .005$	Expected	7.5	15.75
$df = 2$			
	≤ 5000	9	33
	Expected	13.5	28.35
	> 5000	16	12
	Expected	9.0	18.90
	Total	30	63

Table 45. The Relationship of Illegal Campsite Size to the Presence of a Trail Intersection.

Illegal campsites	<u>Size m²</u>	<u>Intersection</u>	<u>No Intersection</u>
	≤10	7	32
	Expected	8.41	30.4
$\chi^2 = 6.69$			
	≤50	23	75
$p < .25$	Expected	10.4	78.9
$df = 5$	≤200	17	59
	Expected	14.8	60.3
	≤500	5	32
	Expected	7.5	30.2
	≤1000	4	15
	Expected	3.8	15.2
	>1000	1	19
	Expected	4.0	16.0
	Total	57	232

Sensitivity of different forest types to damage is discussed extensively in the trail section. Table 46 shows the distributions of campsites by major forest type. Shelters, of course, tend to be in the higher elevation types. A majority of campsites are in mesic forest, far more than the amount of maintained trail in this forest type. There are relatively more legal sites in mesic forest than illegal sites. Mature or virgin forest harbor 19 percent of the legal sites and 29 percent of the illegal sites. Much of the virgin forest in the park, on steep slopes, tends to inhibit camping and limits the size of the illegal sites. The large number, but small size, of the illegal sites in the LeConte section is probably related to the steepness of the slopes.

The size of legal campsites does not seem to relate to general forest type very strongly. If the shelters were included, a number of the most disturbed sites would be in spruce-fir and northern hardwoods. Of the small campsites ($<1000 \text{ m}^2$), 68 percent are in mesic forests, and, of the large campsites ($>5000 \text{ m}^2$), 79 percent are in mesic forest. This difference is probably not significant in terms of management. There are fewer large illegal sites in xeric forest and more in mesic type forest. Spruce-fir and northern hardwoods support both large and small illegal camps (Table 47).

Table 46. The Relationship Between Major Forest Type and Site Placement.

	<u>Spruce</u>	<u>Northern Hardwood</u>	<u>Mesic</u>	<u>Xeric</u>	<u>Early Successional</u>
Trail Sections 2026	310 (15%)	198 (10%)	723 (36%)	753 (37%)	42 (2%)
Shelters 20	6 (30%)	6 (30%)	5 (25%)	3 (15%)	0 (0%)
Campsites 93	3 (3%)	9 (10%)	66 (71%)	13 (14%)	2 (2%)
All legals 113	9 (8%)	15 (13%)	71 (63%)	16 (14%)	2 (2%)
Illegals	28 (10%)	38 (13%)	126 (44%)	74 (26%)	22 (8%)
		<u>Mature or Virgin</u>		<u>Successional</u>	
All Legal Sites	22 (19%)		91 (81%)		
Illegal	84 (29%)		205 (71%)		

Table 47. The Relationship Between the Size of Sites and Forest Type.

Legal Campsites

<u>Size of Site</u>	<u>Forest Type</u>				<u>Early Successional</u>
	<u>Spruce</u>	<u>Northern Hardwood</u>	<u>Mesic</u>	<u>Xeric</u>	
< 1000 m ²	3(9%)	3(9%)	23(68%)	5(15%)	0(0%)
< 5000 m ²	2(6%)	4(12%)	21(64%)	5(15%)	1(3%)
> 5000 m ²	0(0%)	2(7%)	22(79%)	3(11%)	1(4%)

Illegal Campsites

< 50 m ²	12(9%)	17(12%)	45(33%)	48(35%)	15(11%)
< 500 m ²	12(11%)	16(14%)	54(49%)	23(21%)	6(5%)
> 500 m ²	3(8%)	5(13%)	27(69%)	3(8%)	1(3%)

It should be noted, at this point, that the positions of large legal and illegal camps indicate user preferences to some extent and that these choices are anything but a random selection of the available forest. Open canopy and early successional areas are used far in excess of their availability in the park. The park consists mostly of closed canopy forest. Mesic forest areas are used far more frequently than xeric. Mesic forests often have sensitive herbaceous understories and may support the spectacular low elevation wildflower communities for which the park is famous. In a number of sections of the park, such as Elkmont, some of the legal sites and quite a few of the illegal sites have been placed in the middle of plant communities with concentrated vernal flowering displays.

Sixty percent of the most intensively used shelters are in spruce-fir or northern hardwoods. Given the levels of use permitted, it is probably fortunate that these areas have shelters rather than campsites, at least in terms of soil erosion, but it also implies extensive problems with firewood gathering in some of the most distinctive ridgeline areas in the park.

The Control of Illegal Camping.

Illegal camping is widespread in the park and accounts for 10 percent of the total camping disturbance, 25 percent of the bare soil, and

40 percent of the firepits (Table 24). Fifty-three percent of the illegal sites fall within the size range of legal sites (Table 48). Of sites with a total area greater than 500 square meters, 90 are legal and 39 are illegal. Of sites with an area of bare soil greater than 50 square meters, 100 are legal and 63 are illegal. Twenty of the illegal sites sampled had over 1,000 square meters of total disturbance.

Illegal camping is clustered in certain areas and may be related to bear problems. Figure 17 shows bear incidents for 1974-1976 (Singer and Bratton 1977). Illegal camping is a serious problem in three of the areas having bear problems (Maddron Bald - Big Creek, Elkmont and Mt. LeConte) and may be related to bear problems around individual sites such as Steel Trap 68 (Upper Forney Creek) and Hazel Creek Cascades area (80 and 31). (Compare to Figures 22 and 23.)

The areas most in need of an illegal site cleanup are along Big Creek (with 10 illegal sites within a mile of Walnut Bottoms), the Rough Creek area above Elkmont, and the upper end of Forney Creek Trail. Mt. LeConte area has quite a number of small sites which need to be patrolled along with some of the sites on the Appalachian Trail. The positions and sizes of illegal camps are shown in Figures 18 through 23.

GREAT SMOKY MOUNTAINS NATIONAL PARK

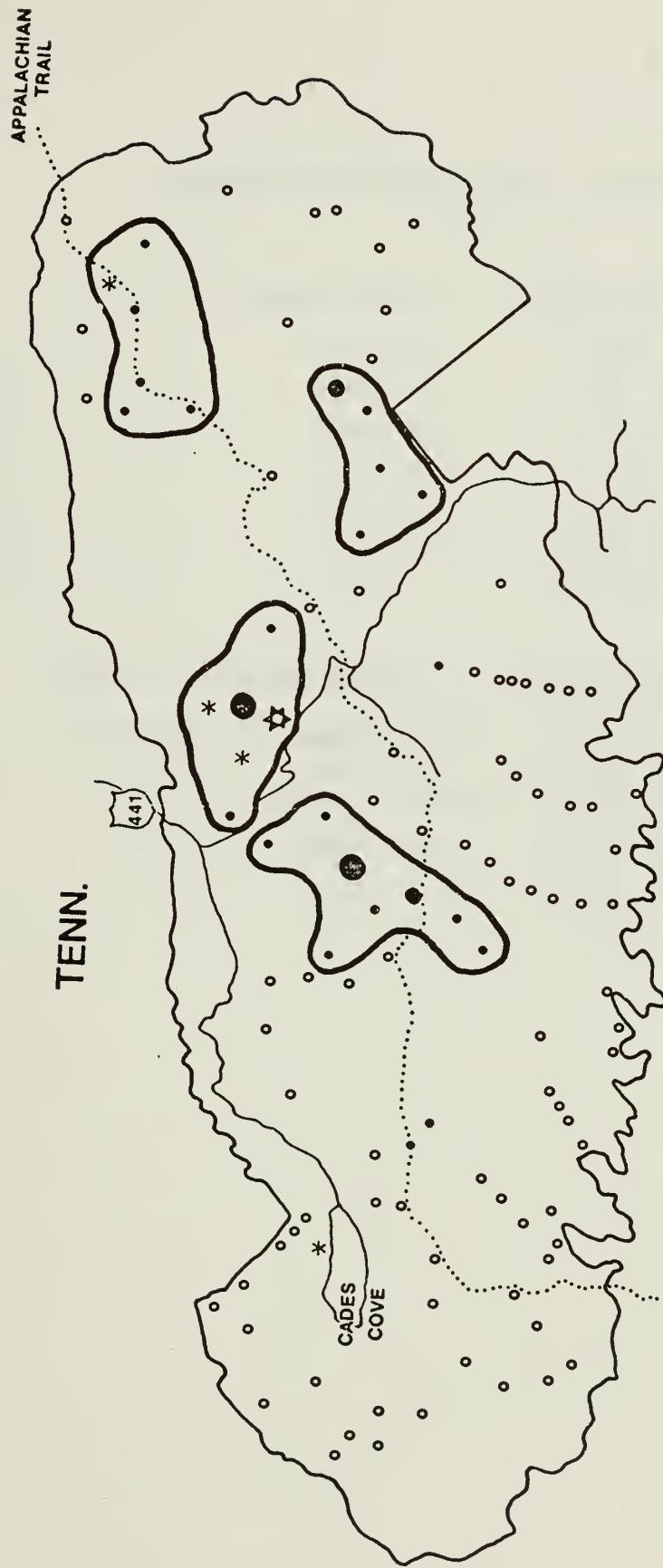


Figure 17. Number of back-country bear incidents 1975-76.

- Backcountry sites with no incidents reported.
- Backcountry sites with 1-5 reported incidents.
- Backcountry sites with 6-9 reported incidents.
- Backcountry sites with 10-15 reported incidents.
- Trails with 1-9 incidents reported.
- ★ Trails with >10 incidents reported.

Cluster areas of problem sites:

- 1) Mt. LeConte
- 2) Elkmont - Silers Bald
- 3) Maddron Bald - Walnut Bottoms
- 4) Chasteen Creek - Heintooga

Table 48. Size Classes of Legal and Illegal Campsites.

<u>Total Area m²</u>	<u>Legal Sites</u>	<u>Illegal Sites</u>
≤ 10	0 (0%)	39 (13%)
≤ 50	0 (0%)	98 (34%)
≤ 200	6 (5%)	76 (26%)
≤ 500	17 (15%)	37 (13%)
≤ 1000	9 (8%)	19 (7%)
≤ 5000	38 (34%)	17 (6%)
> 5000	43 (38%)	3 (1%)

<u>Bare Soil m²</u>	<u>Legal Sites</u>	<u>Illegal Sites</u>
≤ 10	11 (10%)	155 (54%)
≤ 50	2 (2%)	71 (25%)
≤ 200	39 (35%)	48 (17%)
≤ 500	36 (32%)	12 (4%)
≤ 1000	15 (13%)	2 (1%)
> 1000	10 (9%)	1 (.3%)

Figures 18 and 19.

The position and size of illegal sites related to legal sites.

Figure 18 shows the Abram's Creek section and part of Cades Cove.

Figure 19 shows the LeConte section, including sites on manways.

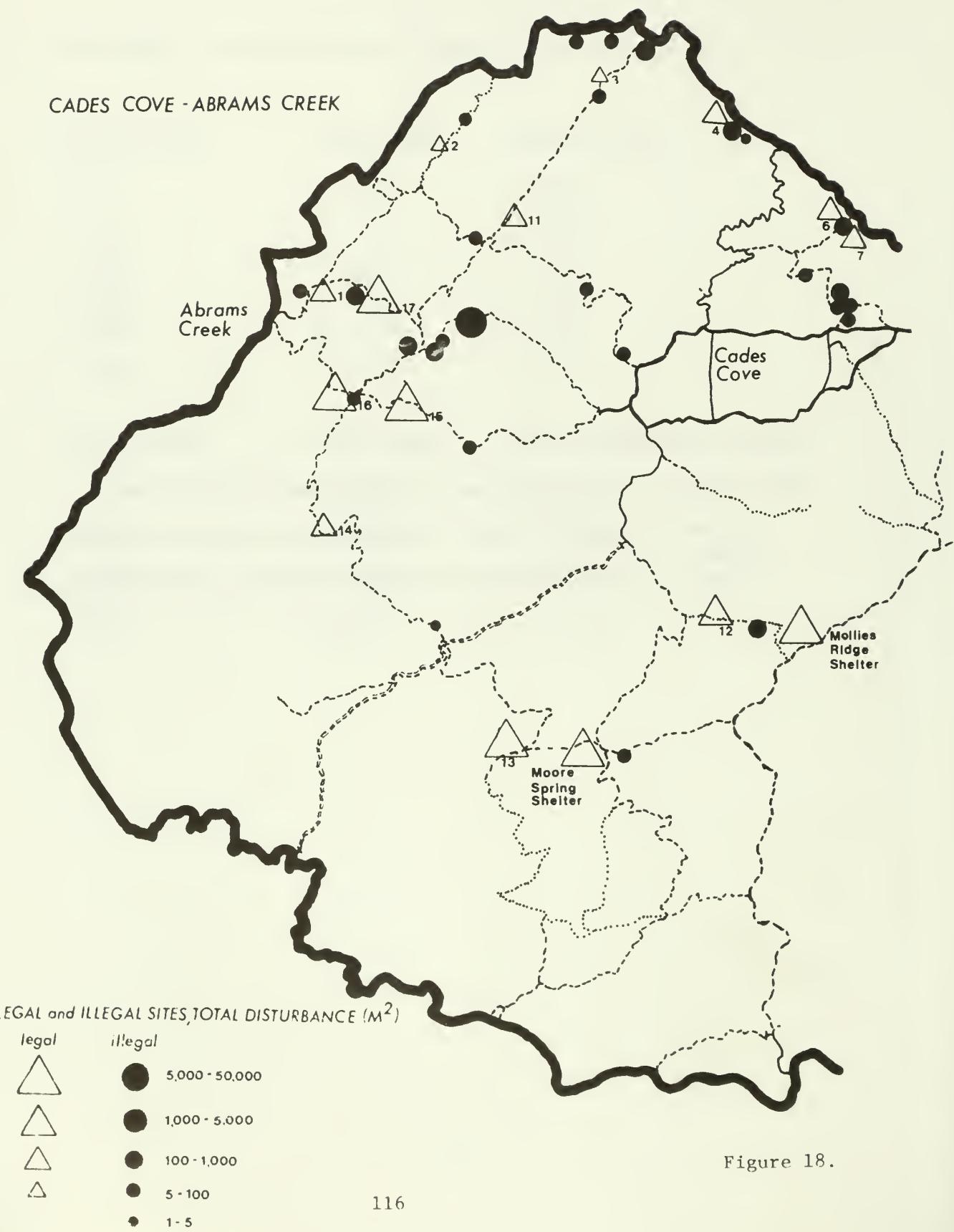


Figure 18.



Figure 19.

Figures 20 and 21.

The position of illegal campsites.

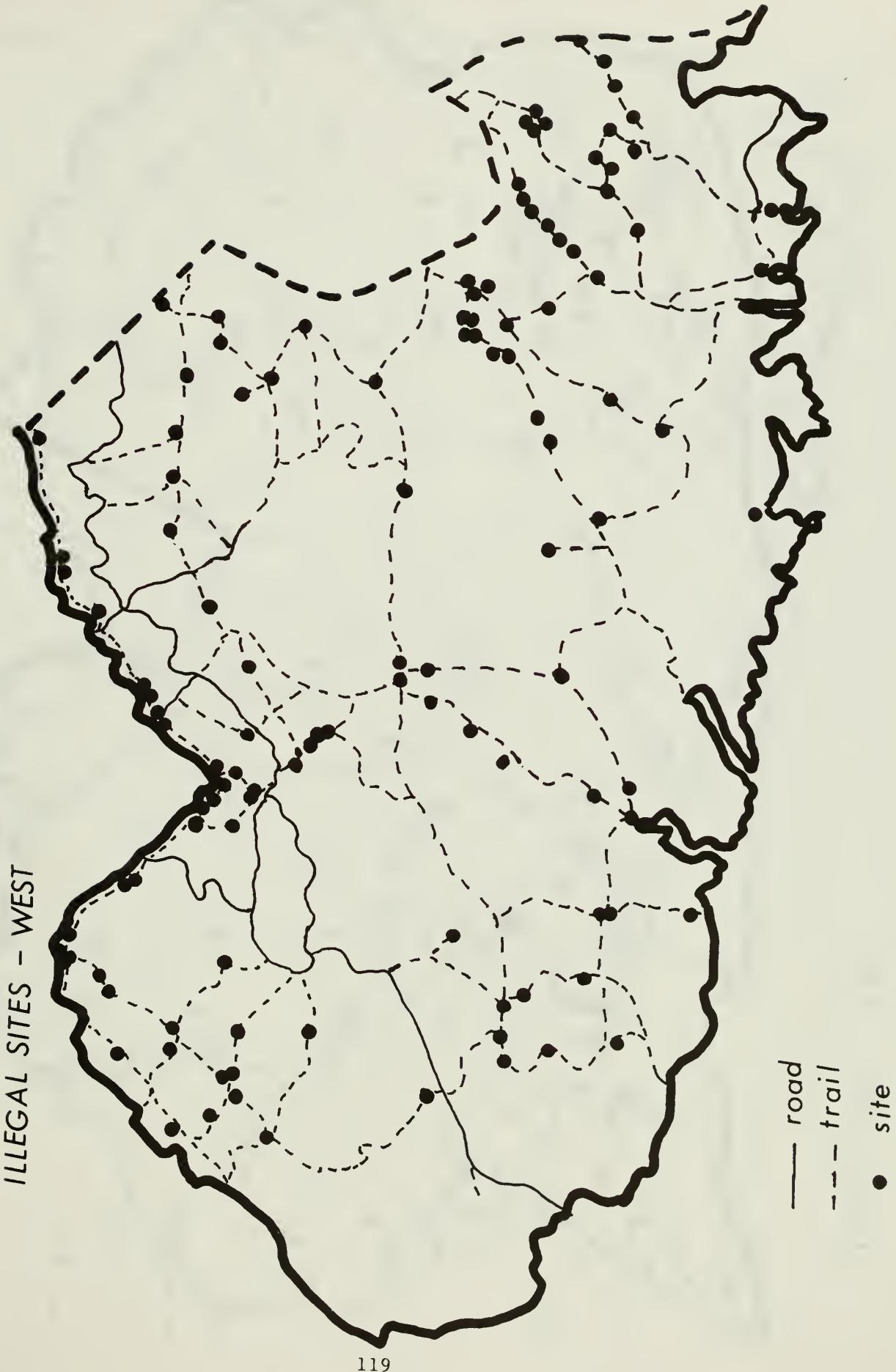
All sites not on manways are shown, including the very small ones.

Figures 22 and 23.

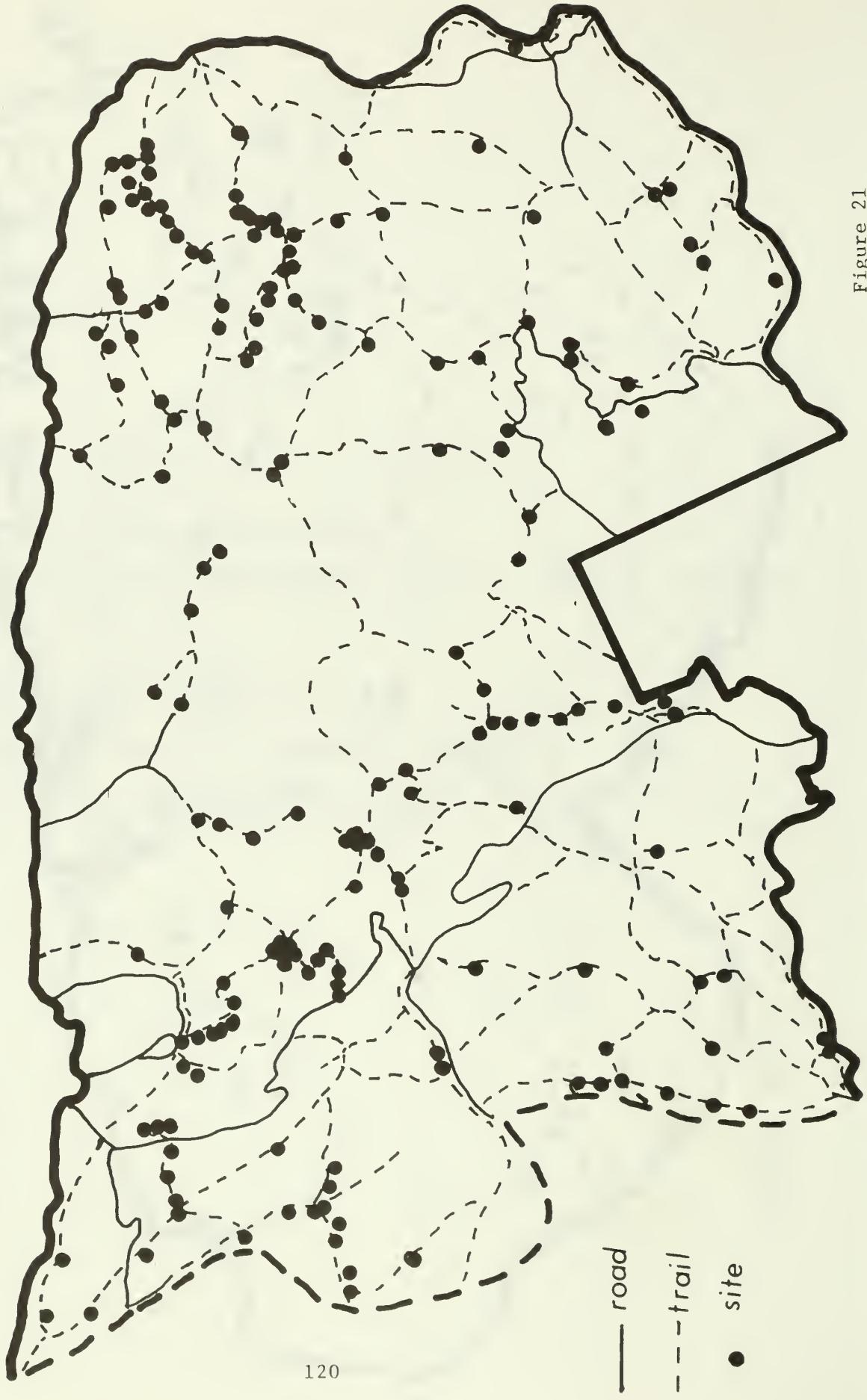
The positions of the large illegal campsites.

Note the cluster areas of problem sites, particularly around Forney Creek and Walnut Bottoms.

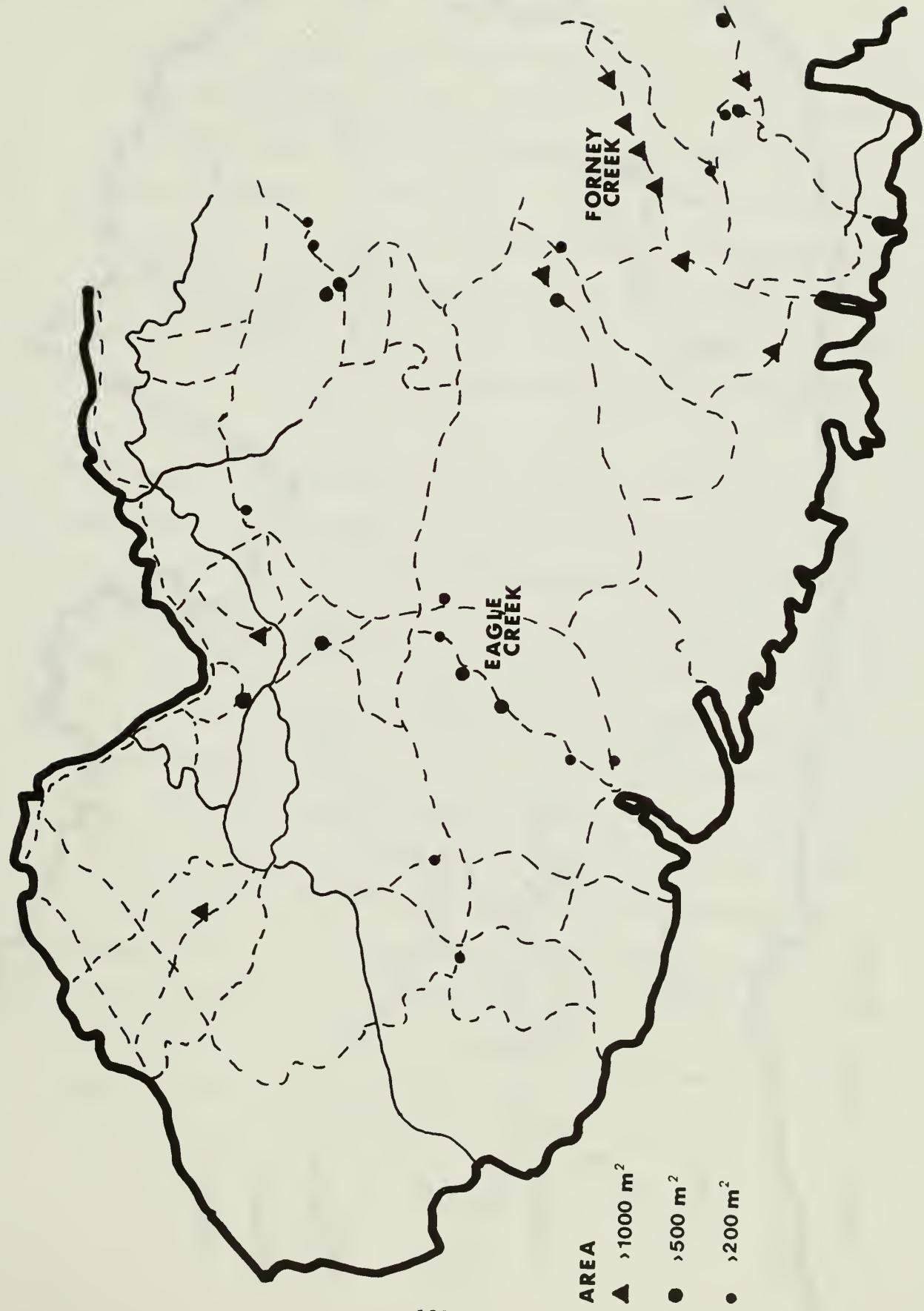
ILLEGAL SITES - WEST



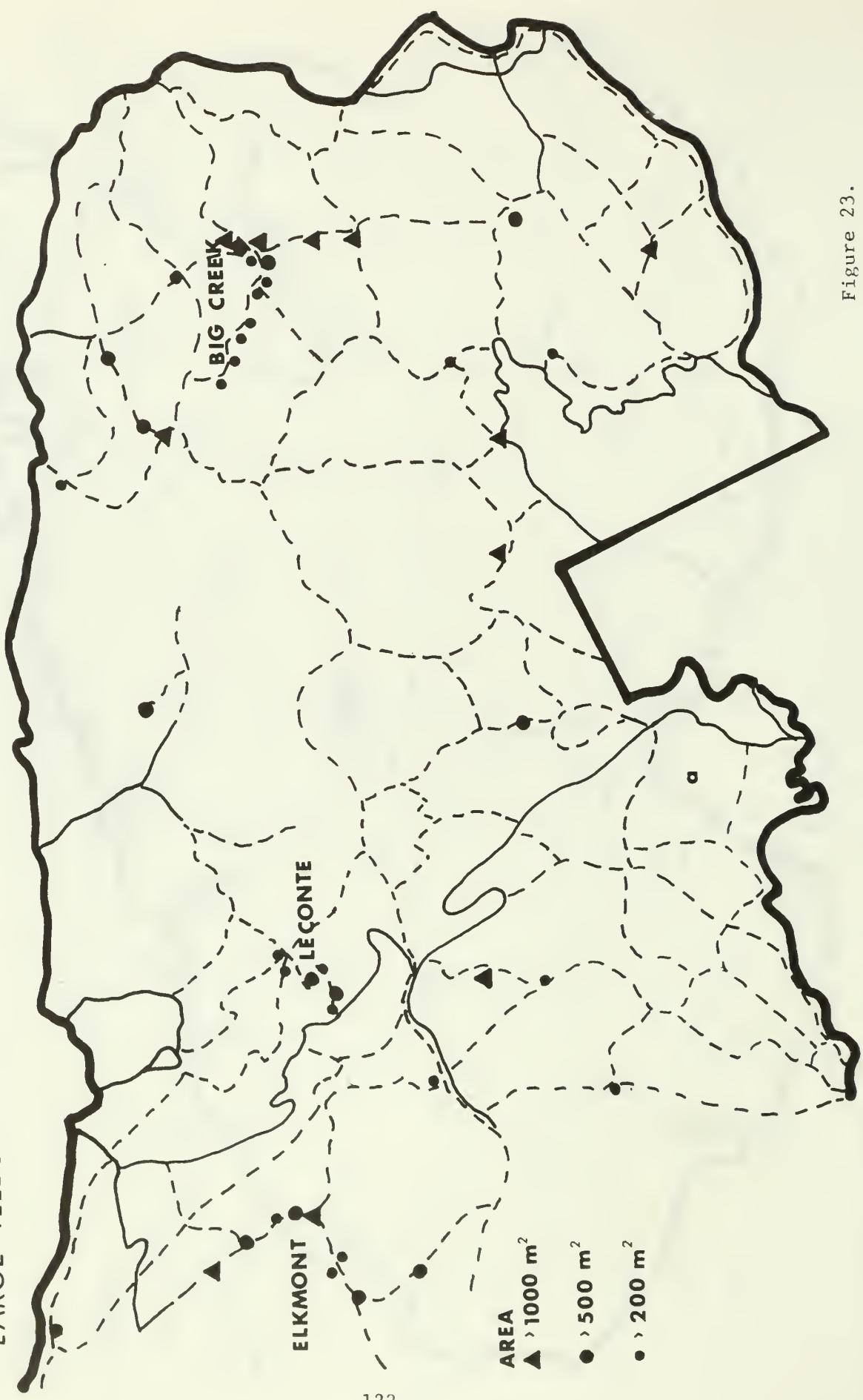
ILLEGAL SITES - EAST



LARGE ILLEGAL SITES



LARGE ILLEGAL SITES



Illegal sites may be very near legal sites and are frequently mistaken for them (Note campsites 4 and 3 in Figure 17). Part of this problem stems from the poor backcountry maps available to hikers and lack of markers on the camps. In some cases the sites are extremely difficult to locate (66 for instance), or parties stop too soon and camp before they reach the site (above Steel Trap and 68, for instance). Difficult fords frequently have illegal campsites on either side. Once a large illegal site is established, it will probably continue to be used.

The condition and camper densities in some legal sites may be encouraging illegal camping. It is not uncommon to encounter couples or groups who want to "get away from everyone" and do not intend to share a site with anyone else. These people may move above or below their assigned site (and not even get a permit). Mud and garbage in a site not only encourages dispersal away from the center of the site, but may encourage people to move away from the site entirely. Table 49 shows the field ratings for legal and illegal campsites. Seventy-four percent of illegal sites had firewood available at the site (a good rating), as opposed to 17 percent at the legal sites. Eighty-five percent of the illegal sites had low trash ratings, as opposed to 48 percent of the legal sites. Sixty-eight percent of the illegal sites had low mud and dirt ratings, as opposed to 25 percent of the legal sites. Illegal sites thus tend to offer privacy,

Table 49. Field Ratings for Legal Versus Illegal Campsites.

Field Rating	Site Type	Good or Low 1 - 2	Fair or Moderate 3	High or Poor 4 - 5
Carrying capacity $\chi^2 = 10.07$ p < .01	Legal Illegal	23 (20%) 105 (36%)	59 (52%) 128 (44%)	31 (27%) 56 (19%)
Frequency use $\chi^2 = 137.88$ p < .001	Legal Illegal	20 (18%) 232 (80%)	35 (31%) 44 (15%)	58 (51%) 13 (4%)
Wood gathering $\chi^2 = 160.00$ p < .001	Legal Illegal	19 (17%) 213 (74%)	50 (44%) 62 (21%)	44 (39%) 24 (8%)
Trash dispersal $\chi^2 = 61.93$ p < .001	Legal Illegal	54 (48%) 245 (85%)	38 (34%) 35 (12%)	21 (19%) 9 (3%)
Mud and dirt $\chi^2 = 47.93$ p < .001	Legal Illegal	28 (25%) 197 (68%)	62 (55%) 67 (23%)	23 (20%) 25 (9%)
Vegetation damage $\chi^2 = 82.79$ p < .001	Legal Illegal	25 (22%) 196 (68%)	51 (45%) 74 (26%)	37 (33%) 19 (7%)
Sanitation $\chi^2 = 2.38$ p < .25	Legal Illegal	44 (39%) 119 (43%)	45 (40%) 123 (44%)	21 (19%) 37 (13%)
Placement $\chi^2 = 26.13$ p < .005	Legal Illegal	79 (70%) 113 (39%)	20 (18%) 94 (33%)	14 (.12%) 81 (28%)
Drainage $\chi^2 = 5.33$ p < .07	Legal Illegal	56 (50%) 166 (58%)	48 (42%) 88 (31%)	9 (8%) 33 (11%)

cleanness, and high wood availability. Overuse and bear problems in legal sites may favor illegal camping, especially if backcountry patrol is absent.

References

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Singer, F.J. and S.P. Bratton. 1977. Black bear management in Great Smoky Mountains National Park. Uplands Field Research Laboratory Management Report No. 15. 35 pp.

